THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1635.] LONDON, SEPTEMBER 11, 1894. [46TH YEAR. PRICE 6d.

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☞ Retort Setters sent to any part of the Kingdom.

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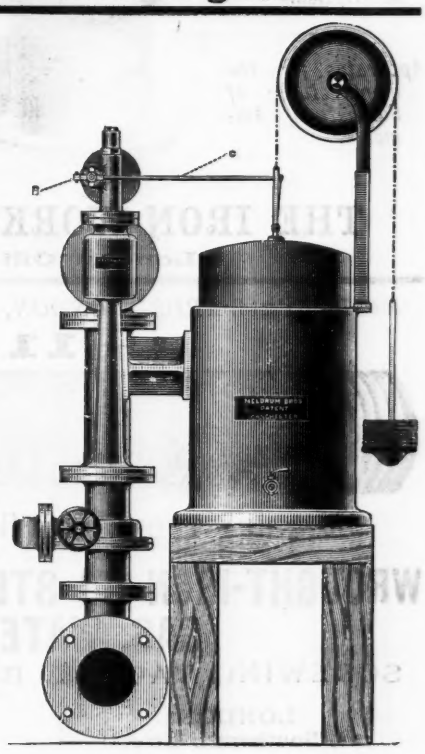

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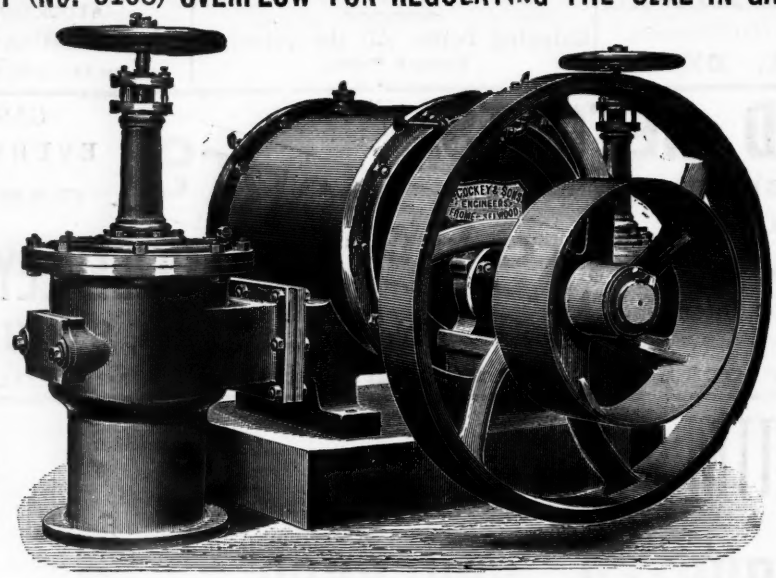

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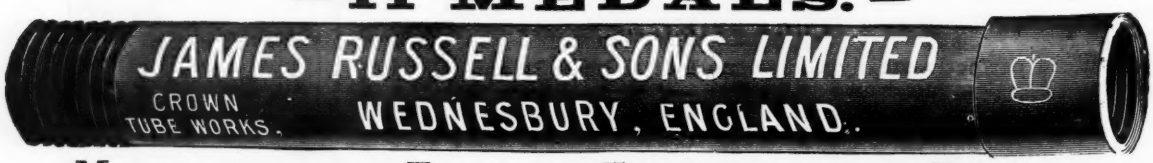

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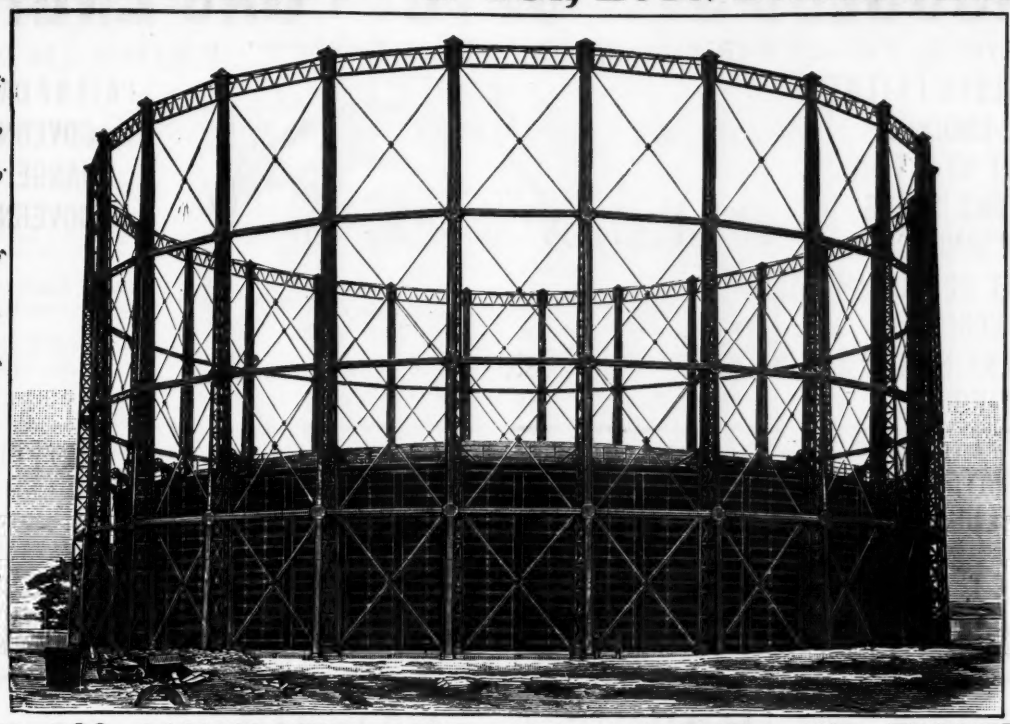

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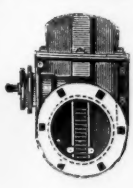

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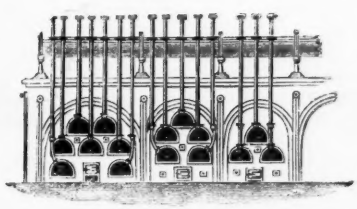

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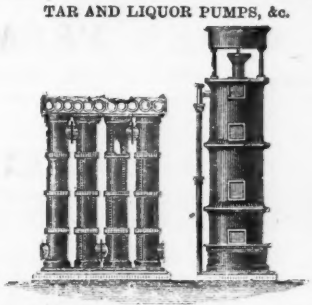

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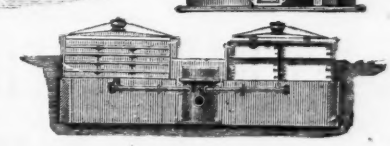

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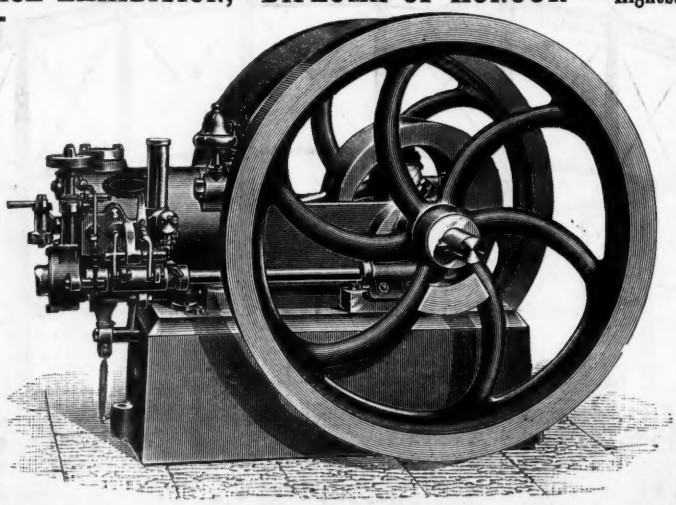

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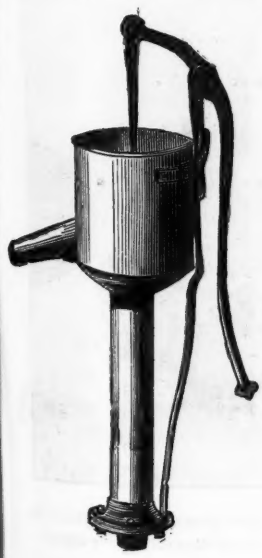

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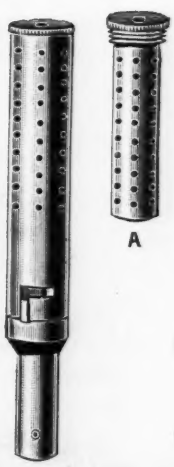

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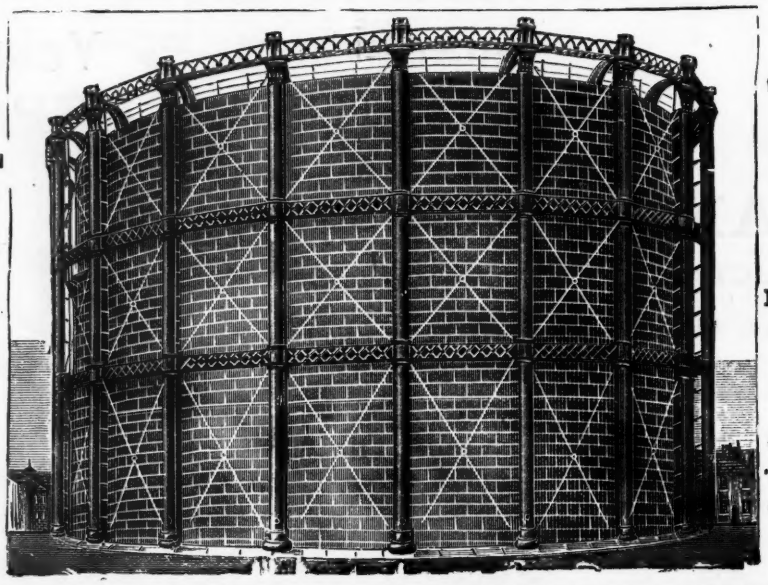

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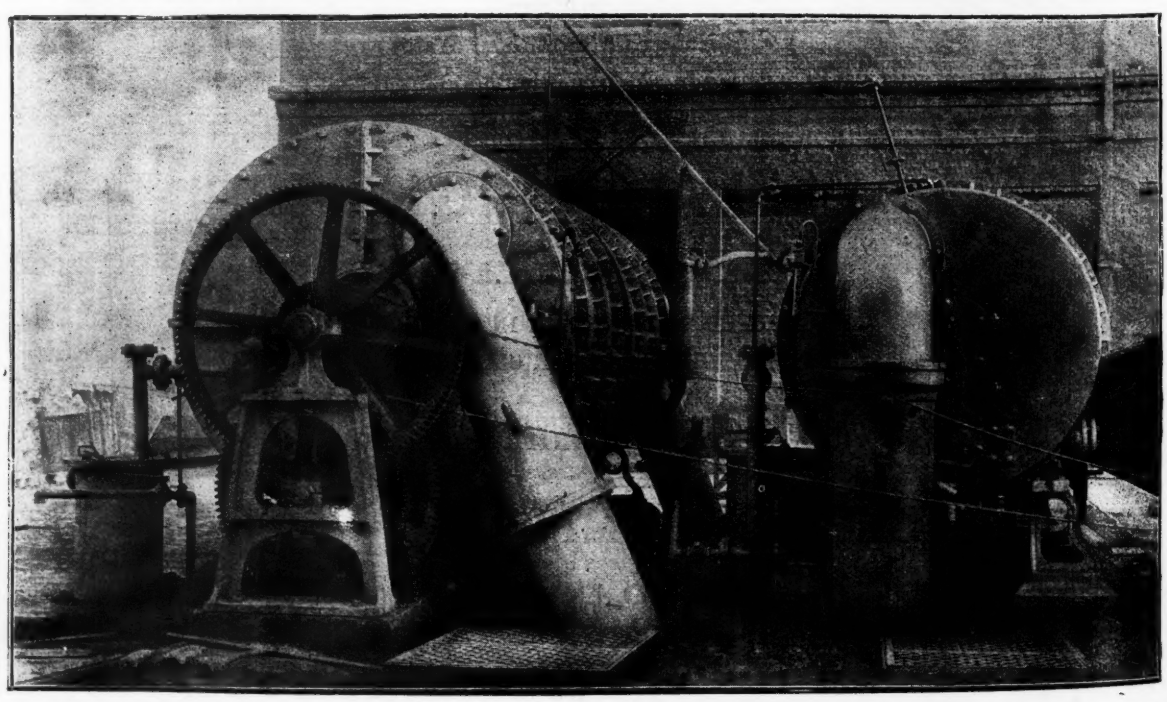

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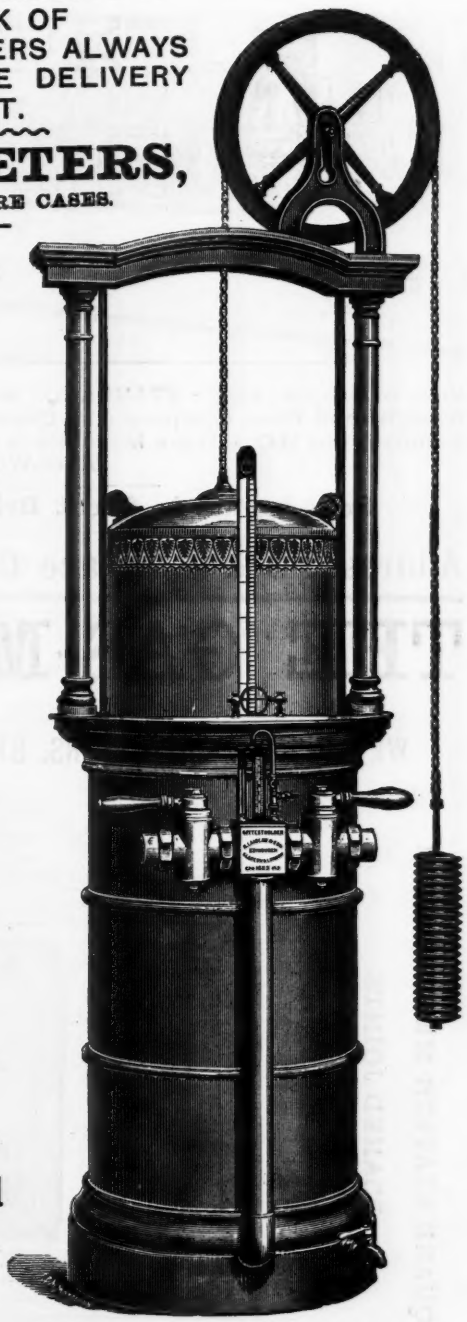

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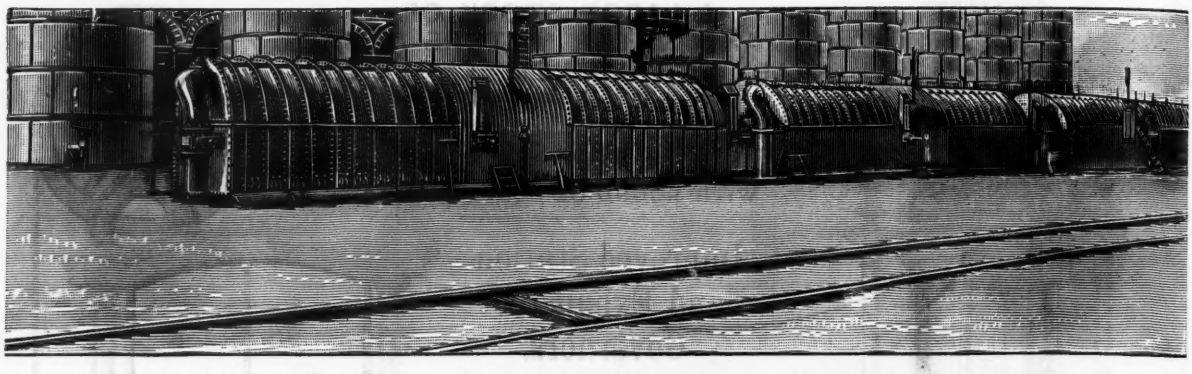

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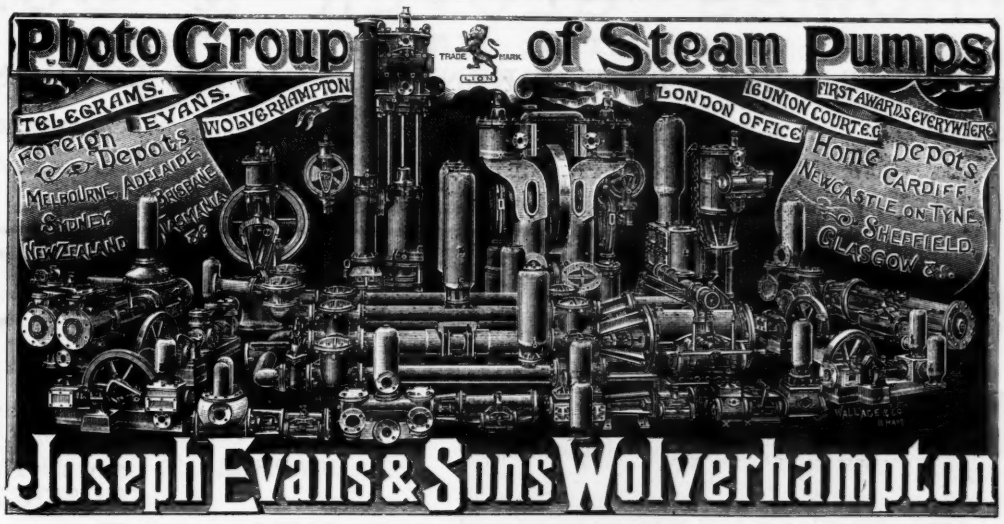
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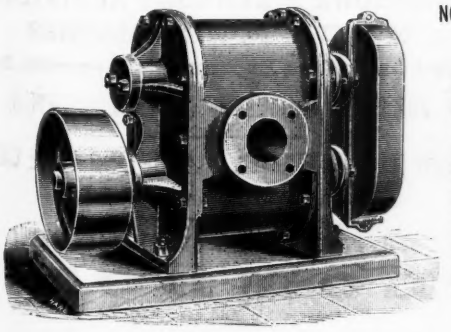
NO SLIDES OR FRICTIONAL WORKING PARTS.



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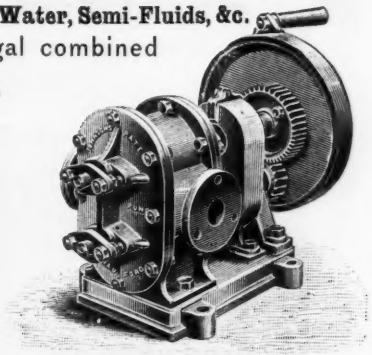

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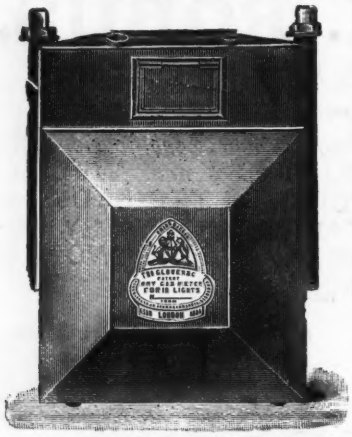

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8th.—Cannot be tampered with without visibly damaging the outer case.
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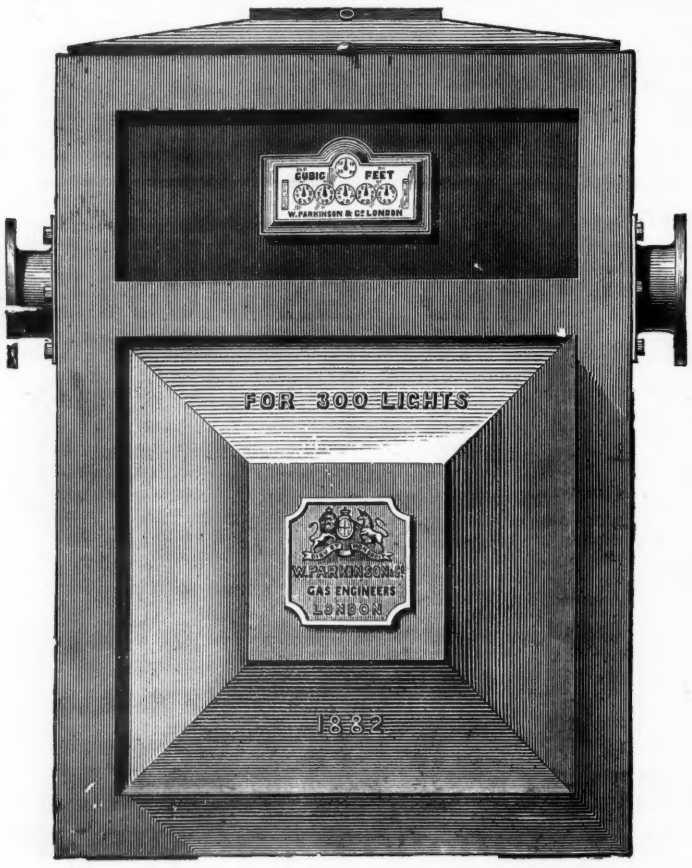

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 11, 1894.

Light from America on Low-Grade Gas.

SOME further information respecting the economics of carburetted water-gas manufacture is contained in the admirable lecture by Herr W. von Oechelhaeuser, on "The Gas Industry in the United States," a translation of which has run through the last half-dozen numbers of the JOURNAL; and we desire to give expression here to the gratitude felt by British gas engineers to the eminent General Director of the German Continental Gas Company for the benefit he has conferred upon the profession at large by thus publishing the fruits of his American tour. Herr von Oechelhaeuser has not been carried away by an access of enthusiastic admiration of the American speciality in question; and so far he must have disappointed the interested advocates of the system among the technical press and elsewhere, who affect to believe that carburetted water gas represents everything that is really progressive, beautiful, desirable, and effective in the American gas industry. He does not think that the future of the gas industry in Europe is bound up with the extent to which carburetted water gas may be adopted here; and he roundly declares that Americans have yet much to learn from German gas engineering practice. Nevertheless, Herr von Oechelhaeuser thanks American engineers for what they have done in working out the manufacture of water gas, in which he frankly admits they have achieved "really splendid results," and have thereby enabled their European colleagues to take up this branch of technics at any time when the conditions may render such a course necessary or advantageous.

Clearly, Herr von Oechelhaeuser does not think that carburetted water gas is as yet ripe for general European use. The chief advantage claimed in respect of it, so far as the consumer is concerned, is that it has a higher illuminating power than ordinary coal gas. But, as Herr von Oechelhaeuser shows, if light-sources of high illuminating power are wanted, the Welsbach burner is capable of supplying them from the commonest coal gas. These burners are not in general use in the United States—and naturally, for it does not suit gas companies charging a fancy figure for high-power carburetted water gas to recognize this way of turning their strategical position. For it should be understood more clearly than it appears to be, that the much-lauded high-power carburetted water gas is not a cheap article in the States. Greatly as Herr von Oechelhaeuser admires the water-gas engineering of Messrs. Humphreys and Glasgow, as well as Professor Wilkinson's system, he is not blind to the truth that, for whatever reasons carburetted water gas has become so rapidly and so widely popular in America of late years, cheapness of manufacture and low selling price are not among them. He is very explicit upon this head. "The "fact is," he says, "I have found that in most establish-"ments manufacturing water gas and coal gas, the aver-"age cost of both, taking in everything, all the year "round, while varying according to the price of the coal "and oil, was, upon the whole, practically the same." And we give in our "Technical Record" in the present issue a statement by Mr. F. Bredel which goes to show that coal gas is anything but "played out" in the United States. This authority, indeed, gives a table of figures showing that coal gas is still cheaper in the United States than carburetted water gas, "when both are calculated to "candle power."

All these disclosures tend to throw light upon the origin of the show of anger made in certain American quarters over the position taken up by leading English gas engineers, and supported by the JOURNAL, in regard to the practical sufficiency of low-grade gas for town supplies. We are *anathema* to the water-gas interest of the States—not because, as it is pretended, our English stolidity and narrowness refuses to admit the merit of American water-gas engineering, but because we have persisted in questioning the basis upon which the water-gas industry—apart from technical considerations—has been built up. The publications devoted to the water-gas interest know no surcease from abusing the JOURNAL; for which we are greatly obliged to them. Sometimes, however, such a periodical will condescend to argue the point; and then we are willing to attend to it. One of these our contemporaries remarked recently: "We are "aware that many tricks were employed in the earlier days "of water gas to force it into the field; but let us not, on "that account, and at this late day, refuse to recognize its "value, and make use of it where it will help us against "our keen competitors. Let us give the devil his due." By all means; but what we cannot agree to is overpaying the gentleman. We are assured, for instance, that it was only "when electric light opposition became active that "the gas consumer demanded the highest candle power "that could be furnished. . . . Many an American "gas engineer of the old school argued just as our con-"temporary is now arguing, but was finally forced by the "stern logic of events to adopt the hitherto vilified water "gas." Just so; but of what nature were these "events"? Was it electric lighting competition that carried water gas into Boston? What are the "events" whose stern logic has tunnelled the East River at New York; and how much of the same kind of motive power will it take to alter the gas supply of Cleveland?

The "bottom fact" of the position is that low-grade gas, aided by the incandescent and other high-efficiency burners, as Herr von Oechelhaeuser sees, will do all that

high-grade gas can effect in the way of brightening up a town; and at a much lower cost. This last is the point. Some Americans would persuade us that the inhabitants of New York and other cities are quite pleased to pay 6s. 3d. per 1000 cubic feet and upwards for high-power gas, and would not like ordinary coal gas at a reduction in price of 30 per cent. But it is enough to say, in reply to this assertion, that they have never been consulted on the matter. Lastly, we have been asked why, if the incandescent gas-burner is such a good thing for coal gas, it should not be equally good for American water gas. But the futility of the question is too much even for the querist, who admits that the necessity is "not nearly so "great." Clearly not; for who would pay for carburetted water or even coal gas, only to derive the same lighting effect from it that uncarburetted coal gas is demonstrably capable of yielding?

So far, therefore, the American attack upon the case for low-grade gas has not damaged it in the slightest degree. It only remains for us to make it clear that we have no quarrel with carburetted water gas in itself, but only protest against having it thrust upon the technical world under false pretences, and seeing it employed to prop up a fallacy of gas polity. If carburetted water gas is cheaper, quality for quality, than ordinary coal gas, by all means let it prosper in the land. But even so it would not follow that it should be made of 25 or 30 candle power, and the public be required to pay accordingly. If the American consumer chooses to take this high nominal rating of his gas as a set-off against the way in which he is treated in regard to the supply, it is his affair. Unfortunately, the consumer, like the coal-gas man, is dumb under the handling of those who "exploit" him; and nobody knows what he thinks of those who pretend to speak in his name because they take his money.

The Eastern Counties Meeting—The Guarantee of Meters.

The members of the Eastern Counties Gas Managers' Association met in good force at Great Yarmouth on Thursday last, under the presidency of Mr. W. J. Carpenter, Engineer and Manager of the gas-works. The visitors were entertained to luncheon at the Royal Assembly Rooms in the town by the Directors of the Gas Company, and two papers were read—the first by Mr. W. D. Child, of Romford, on "Retort House Con-"struction," and the second by Mr. H. Wimhurst, the Honorary Secretary of the Association, on "The Prepay-"ment Meter System." Mr. Child's paper was distinctly good of its kind; and the kind is one that District Associations of Gas Managers usually highly appreciate. The contribution of Mr. Wimhurst was a concession to contemporary interest in the subject; and the fact of his being able to show satisfactory results from the application of the prepayment meter system among what is practically a rural community, is very encouraging. Mr. Wimhurst, in common with all other users of automatic coin machines, experiences considerable trouble from damaged and misshapen pennies. Hitherto the Mint authorities have not been so careful of the condition of the bronze as of the gold and silver currency; but it is to be hoped that somebody will stir them up in this regard, in the interest of the traders by machinery. Mr. Wimhurst and some other gas managers have a grievance against the makers of these automatic prepayment meters in respect of the extent of the guarantee. It has been the custom of dry-meter makers to guarantee these instruments for five years; but they have only agreed to guarantee prepayment meters for one year, which Mr. J. T. Jolliffe described on Thursday as "shabby." It is a small matter, after all, and so purely a question of business, that it seems a pity to bandy hard words over it. There is something to be said on both sides. It might be argued that a five years' guarantee is absurdly long for any machine, or that a twelve months' guarantee is too short, especially if dated from the time of invoicing the meter.

We have refrained from mentioning this question of the guaranteeing of prepayment meters, because it is essentially a trade matter which buyers and sellers ought to be competent to settle between themselves, as they doubtless will. Yet if, by uttering a word in season, it is possible to help forward a settlement of a dispute which appears to exasperate some ordinarily calm and reasonable individuals, we are prepared to do our best in this way. Frankly, then, we think that, if all the mechanical trades of the country were polled on the subject, it would transpire that the five years' guarantee of dry meters is so exceptional, that the general sense would be upon the side of the meter makers in refusing to extend it to a new article of trade. With how many machines bought by gas managers can anything like the same guarantee be obtained? The thing is exceptional, and only to be accounted for by searching back to the era when the comparative advantages of wet and dry meters constituted a "burning question" in gas engineering circles. Dry meters were only with difficulty established in the affections of gas managers; and so greatly were they distrusted, that the makers were fain to stretch the point of the guarantee to a limit which overcame all reasonable objection. We do not say that a five years' guarantee is unnecessary for dry gas-meters, or that the arrangement is worth disturbing; but it certainly does not follow that such a purely mechanical attachment as that for the automatic delivery of gas upon the deposition of a coin, should be guaranteed for an equal period. Suppose gas managers had to buy the mechanical attachment separately, of any clock maker, and fix it themselves, what guarantee would they be likely to get in this eventuality? Moreover, the distinction between the thing guaranteed in the case of a meter pure and simple, and of a penny-in-the-slot attachment, is plain. If a meter goes wrong, it must be on account of something bad in its construction. Nobody touches it—nothing happens to it but the passage of gas through it; and the manufacturer knows what his risk is if he vouches for the article standing this ordinary usage for a term of years. On the other hand, the automatic prepayment meter is meant to be handled; and nobody could say offhand, when these machines were first experimented with, how they would stand the extra wear and tear—not merely upon the registering, but also upon the measuring parts of the apparatus. The makers might be prepared to guarantee that their work would stand fair usage; but they might also reasonably urge that, as these appliances are put in to suit the sellers of gas and the buyers of it in small quantities, it is not for the mere machinists to bear the brunt of all the battered coins and other incidents of this kind of traffic. In short, the meter maker might say that he would be prepared to guarantee the good behaviour of his mechanism, but not that of the penny-in-the-slot gas consumer. Mr. Child hit the mark in Thursday's discussion when he said that it would not take three months to find out whether or not a prepayment meter was unreliable. This is the meter manufacturers' point. If, by insisting upon a long guarantee, the gas manager is merely seeking to make the meter manufacturer answerable for the rough treatment to which meters may be subjected at the hands of rough customers, he is certainly not justified in so doing.

The Provisional Orders of the Past Session.

The Board of Trade report upon the proceedings of the Department under the Gas and Water Works Facilities Act has been issued, from which the fate of the Gas and Water Orders applied for last December may be ascertained. It is stated that application was made for nine Gas Orders, involving a total share capital of £142,500, and £50,000 of loan capital. Objections were lodged against some of the applications; but all were granted, with certain modifications and amendments, with the solitary exception of the Broadstairs application. Numerous objections were lodged against this scheme, which was for the construction of additional storeage works; and Major Marindin held a local inquiry into the matter. He reported that the Company needed the accommodation, and that the site proposed for it was not unsuitable. But while he held that the objections generally could not be sustained, he was of opinion that, in certain cases, the property of the objectors would be seriously affected by the granting of the Order; and as the Company failed to show that the proposed site was the only suitable one obtainable, he considered that the objections in question should not be overruled. The Board of Trade accordingly intimated that they would not proceed with the Order so long as those objections remained; and as the promoters failed to come to terms with the opponents, the application was not further proceeded with. Major Marindin also held local inquiries at Newquay and at Ilford—in both cases deciding in favour of the promoters the points submitted to him. The sliding-scale was introduced into four

Orders; in one case—that of Worthing—being accompanied by the "neutral zone" modification. Power was reserved to the Board of Trade to vary the maximum price, or to substitute a sliding-scale—after five years in the Newquay Order, and after three years in the cases of Earby and Thornton and of North Bierley. It is noteworthy that the Board of Trade reduced to 5s. 3d. the initial price of 6s. 4d. per 1000 cubic feet asked for by the Bolsover Company, and lowered the demands of the Uttoxeter Company from 3s. 8d. to 3s. 2d. per 1000 cubic feet. Worthing obtained the initial price asked for, but with a neutral zone of 6d. per 1000 cubic feet, as already stated. Ilford did not ask for the sliding-scale, but was content to accept it. On the other hand, Earby and Thornton asked for it, and obtained a maximum instead of the desired initial price. The same treatment was accorded to Newquay, which was refused the right to charge an extra price in the outlying portion of the district. Altogether, the Board of Trade appear to keep a tight hand upon promoters; but it is very much a case of legislation by Inspectors. If the Board's Inspectors were not the thoroughly reliable gentlemen they are, the Gas and Water Works Facilities Act would wear a very different aspect to the community.

The Trade Union Congress.

THE Trade Union Congress which has been sitting in Norwich during the past week succeeded, in a higher degree than any of its precursors, in exhibiting the irreconcilability of the Trade Union spirit with the preservation of individual liberty, and in displaying the impracticable character of that sentiment of Collectivism which is the real inspiration of the newer forms of Trade Unionism. Many well-meaning persons, including the Duke of Devonshire, President of the Labour Commission, have persuaded themselves that in the development of Trade Unionism there is the best promise for the industrial future of the country. They have probably been led to take this view on general grounds, following the aphorism that "Union "is Strength." The saying only holds good, however, when it applies to the co-operation of individuals for the attainment of objects demonstrably beneficial to every one of them separately, or to the majority of them, but placed by circumstances beyond the reach of individuals acting independently. It by no means follows that union is strength when this means the banding of any number of individuals for the pursuit of aims which are not only unattainable, but are also of questionable benefit or are positively detrimental to them separately. The Duke of Devonshire and those who have thought with him concerning the theoretical advantage of Trade Unionism may be expected to alter their minds after learning from the proceedings of the Norwich congress how this movement is actually governed and inspired. Politicians of both the great parties in Parliament have also patted Trade Unionists on the back, and promised them that, if they will only be good boys and vote straight, their own particular wants shall be attended to on the first convenient opportunity. The Norwich congress has supplied an answer to these overtures, calculated to make those who tendered them reconsider their position. It is only too apparent that, under the guidance of a few professional "leaders," who were Socialists before they found their profit in cultivating Trade Unionism, the great bulk of Trade Unionists have gone off the plain road to the material, possible, and useful improvement of the condition of the wage-earning classes, and have turned into a No Thoroughfare of fad and fancy. What becomes of the practicality of the practical man, when he is found in congress voting resolution after resolution in favour of nationalizing not merely land and minerals, but all the means of production, distribution, and exchange; to say nothing of such trifles as rendering the employment of free labourers a penal offence, and making it felony to work more than eight hours a day? The congress rendered itself in this way a melancholy spectacle. The sacrifice of the late Parliamentary Secretary—Mr. Fenwick, M.P.—because he represents upon the Eight-Hour Question the opinions of his parliamentary constituents rather than those of the majority of delegates to the congress, is only in accordance with the spirit of the New Unionism; but the choice of Mr. Sam Woods, M.P., the well-known leader of the Miners' Federation, to succeed him, in place of Mr. Tom Mann, is a blow to the London clique of professional agitators. We cannot leave the subject of the congress without echoing the wise words of *The Times* leading article on the President's address: "We sympathize "entirely with the endeavours of the working classes to "attain to a higher standard of living—though that is not "to be accomplished merely by insisting upon higher "wages—to greater leisure, and to a larger interest than "they now possess in the profits of production. But the "primary and indispensable condition of progress in this or "any other direction is that the productive system shall be "maintained as a 'going concern,' and that no check shall "be given to the process by which capital is incessantly "created, used up, and re-created for productive purposes." It is a national misfortune that the prominent men in the ranks of labour prefer to amuse their supporters by the repetition of the empty generalities of Collectivism, rather than to associate themselves with better-instructed men, with a view to attacking the practical problem.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 520.)

As might be expected, business on the Stock Exchange during the past week has been quiet enough; and there is hardly anything in the way of variety that can be noted. The chief feature was perhaps the disposition to sell in the markets most liable to fluctuation, and to realize the profit derivable from any recent advances. But while the more speculative issues thus suffered a check, the best quality have continued rising without any abatement to their advance. It is worth mentioning that Consols changed hands on Wednesday at 102⅝, *ex* the October dividend; while several bargains in the course of the week were marked at only ⅛ lower. High as this is, there is no reason why they should not go higher if nothing should occur to change the present condition of the Money Market. Business in the Gas Market was quiet, and would have been of the most slender proportions if it had not been for the operations in Gaslight "A." The coming reaction in that issue which we lately noted has progressed during the week; and the stock, which opened at 245½, fell away gradually to a mark of 242 on the closing day. The secured issues, however, were strongly supported by the demand for good investment securities, and each that was dealt in realized high figures; while the "G" preference had a considerable rise. For the second week running, only two transactions were marked in South Metropolitans—stock being very scarce; and again the "B" has advanced a point. Nothing at all was done in Commercials; there being no sellers. The Directors announce an increase of ½ per cent. in the coming dividend, from which it may be augured that the accounts, when issued, will show that this Company has had a continnation of the prosperity which characterized the previous half year. Very little was done in Suburbans and Provincials; but they keep very strong. British is half a point higher; and Crystal Palace was never done below top price. There was a moderate amount of business in Continentals; and they all remain extremely steady. Among the rest, the only changes are improvements in Bahia and Buenos Ayres. Very little business was marked in the Water Companies. But prices were good generally; and in Grand Junction and New River they were higher.

The daily operations were: On Monday, the Gas Market was quiet and firm; prices being well up, but not advancing. New River Water rose 2. Tuesday also was quiet and devoid of feature. British advanced ½; and Buenos Ayres, ¼. Wednesday was much the same; business being very restricted, and prices showing no particular tendency. Buenos Ayres again moved up ¼; and Bahia rose ½. Thursday indicated weakness in Gaslight "A," which fell 1; but South Metropolitan "B" was 1 higher. Friday's business was largely monopolized by Gaslight "A," which held its position; while the "G" improved 5. Grand Junction Water rose 1. On Saturday, Gaslight "A" was further depressed; and the quotation fell 2.

ELECTRIC LIGHTING MEMORANDA.

The Handiness of Incandescent Lamp Switches—An Invention for Modulating Electric Lamps—Dr. Kennedy on True and False Foresight in Design—A New Application of Electricity.

ONE of the familiar arguments of partisans of electric lighting refers to the ease with which incandescent lamps can be turned on and off; and it is claimed that this facility results in marked economy as compared with gas lighting, which, of course, involves the use of those expensive articles, matches, whenever a light is required. Those who employ this argument contend that the obligation of finding matches and striking a light commonly induces people to waste gas by leaving burners alight when they are not really needed, in order to spare themselves the trouble of lighting up afresh every time a room is entered after dark. On the other hand, it has always been made a reproach of incandescent electric lighting that it is not possible to lower the light, which must consequently be either full on or

dead off. In the early days of the application of this system of lighting to domestic and other interiors, attempts were made to accommodate the people who wished to be able to lower the light occasionally, by introducing a resistance into the circuit, which had the effect desired, but only at the cost of wasted energy; so that however much the lamps were dimmed in this way, there was no saving to the user. It was not long before the inconveniences and wastefulness of thus tampering with the lighting efficiency of incandescent electric lamps led to its abandonment for the simpler and more satisfactory plan of placing the switches in such convenient position that the more general purpose of lowering lights in an apartment—to enable a room to be entered after dark without risk of collision with furniture, &c.—was served equally well. The convenience of being able to light up an apartment instantly on entering it, by touching a knob in the wall beside the door, is not to be gainsaid; nor is the equally great convenience of being able to quit the room before putting it in darkness by the same means. In a general way, this advantage has gone far to counterbalance the unmanageableness of electric lighting in point of intensity. Still, however, the impossibility of directly modulating the brilliancy of the incandescent electric lamp has remained an objection to it in certain cases, notably for hotel bedrooms occupied by persons who, for any reason, do not like to be left in utter darkness. According to a somewhat amusing article recently appearing in a Birmingham newspaper, a practice has sprung up in these circumstances of draping the bedroom lamp in some handy article of apparel—preferably a stocking—which shall have the effect of converting the too brilliant electric light into a soothing night-light. The article goes on to describe how a Birmingham man's inventive faculties were excited by the discovery of a lamp artistically shaded in this way in a London hotel; and how this "well-known inventor"—Mr. Thomas Budworth Sharp by name—rested not until he had hit upon a method of increasing or diminishing the length of the exposed filament of an incandescent lamp, whereby the amount of the light shown, and of the energy consumed, could be varied at will. This grand invention, we know not why, is credited by the Birmingham reporter with the potentiality of revolutionizing electric lighting, and making it still more popular for general use—with the consequential effect, of course, of carrying dismay into the ranks of gas engineers. It is difficult to feel the force of this conclusion from what appears at best to be the experimental success of an ingenious device for modulating the illuminating power of incandescent electric lamps. After all, both gas and electric lights pay their suppliers best when fully used; and it would not be surprising if central electric lighting station managers, on being appealed to on behalf of Mr. Sharp's invention, were to confess their preference for the stocking.

An interesting passage of the Inaugural Address of Dr. Kennedy to the Mechanical Science Section of the British Association at Oxford may be held, without too severe an exercise of the critical faculty, to bear upon the case of the London Electric Supply Corporation. Dr. Kennedy was speaking of the responsibility of designing and constructing engineers for adapting their plans, whether for the lighting of a town or for any other work, to satisfy both immediate and prospective requirements. He said that, of course, this problem would be comparatively easy in each particular case, "if only the environment would stand still." It would even be comparatively easy if we knew how the environment was going to alter. But this we cannot do. "We only know that it certainly will change, and will go on changing; and that therefore the things which we make now have not to survive in the conditions in which we make them, but through some new sets of conditions of which we know nothing. I do not think," said Dr. Kennedy, "the difficulty is in any way to be met by the popular method of guessing at what will be wanted fifty years hence, which generally means simply guessing at something very big." Having thus opened up his theme, the speaker went on remorselessly to argue that it is useless to make things after a type which we choose to imagine will be that of fifty years hence. If we do, they will be of no use to-day; and for this very reason they will not be in existence, useful or other, at the end of the fifty years. There are plenty of illustrations of the truth of this observation. Dr. Kennedy said he hoped he should not be considered churlish in expressing disbelief that the men who have worked on this principle have really been far-seeing, or have really brought us much forward. "They have been men often of genius, often of great personal fascination, always of immense imagination. But they have proceeded by methods essentially opposed to anything like the gradual evolution which must occur in technical as it does in natural matters, and in too many cases the results of their labour have not even been giants, but only monsters." These be unquestionably words of wisdom.

It has hardly ceased to be a "nine days' wonder" that electricity can be adapted to the cooking of a dinner. Nobody knows how many dinners have actually been prepared by this means, or how far the electrical apparatus needs to be supplemented by other agencies for preparing hot water, for washing up, &c. We learn that electrical cooking has penetrated to Portsmouth, where the Chairman of the Municipal Electric Lighting Committee recently gave to his friends a dinner so cooked; the necessary appliances being "loaned" for the purpose by the General Electric Company. This is all very well, so far as it goes; but, according to a report in an American contemporary, the development of new applications of electricity is proceeding in the United States at a pace that leaves electrical frying-pans far behind. There they find it useful for killing grass and weeds on railway tracks. The Illinois Central Company are trying this new method of weed-exterminating, which is embodied in a truck carrying a dynamo plant and a sort of brush consisting of a fringe of copper wires depending from its front end, made long enough to cover the whole width of the permanent way. A pressure of 10,000 volts is employed, which report says is found more effectual than steam or salt in "electrocuting" the vegetable growths that spring up so luxuriantly in that fruitful soil. After all, this is a kind of electrical cookery; and if the weeds killed by this means were only edible, the equipage, worked by a vegetarian staff, might be rendered self-supporting. There is evidently more in this than meets the eye.

SOME POINTS IN VENTILATION.

It is impossible to separate the study of ventilation from either that of the lighting or the warming of interiors; so that from time to time we are constrained to devote some of the space of the Journal to the discussion of practical questions arising out of the relationship existing between these branches of domestic sanitation. To these matters, moreover, nothing like sufficient attention is paid by the majority of architects and gas engineers; and this renders it somewhat difficult to freshen up observations upon the general subject by references to new and interesting experiments in these lines. This very fact, however, makes it more incumbent upon those who have at heart the improvement of the sanitary state of the dwellings of the people, to keep such matters well before the professional and general public, in order that it may not be complained that nobody cares for these things. The latest addition to the available stock of information in regard to gas lighting and ventilation which we have had to bring under our readers' notice is the broad result of M. Grébant's experiments upon the use of Argand and Welsbach gas-burners in confined spaces, which, as was chronicled in our "Technical Record" for last week, tends to inspire confidence in the harmlessness of both types of lighting apparatus. Information of this kind is very valuable; but it could be wished that more evidence was forthcoming to indicate that the lighting, warming, and ventilation of public and private buildings is being more systematically studied than has hitherto been customary in this part of the world. We have frequently remarked that British architects, in designing buildings of all descriptions, generally fail to observe sufficient difference, in respect of their lighting, heating, and ventilating arrangements, between houses intended for erection in the country and in town. Yet surely, among the special conditions attaching to a particular site with which architects acknowledge their obligation to deal, those now in question are of sufficient importance to be reckoned.

Far more attention is paid, for example, to the warming and ventilation of private residences by American architects than is the practice here, mainly for the reason that considerations of climate and the taste of householders in the United States and in Canada compel the profession to cultivate this branch of domestic sanitary science. Consequently, American technical periodicals are rarely long without accounts and discussions of plans for heating and ventilating buildings of every kind. It is not often, however, that British architects and engineers can derive much direct instruction from this source, because of the special conditions which American practice is necessarily framed to meet. Severe as these conditions are, they are invariable, and susceptible of calculation. This renders American house-heating methods very systematic. It is noteworthy also that these methods have been developed upon German rather than upon English lines—that is to say, the foundation adopted is that of the stove, and not the open fireplace. Lecturing before the Franklin Institute of Philadelphia on this subject, Mr. Alfred R. Wolff said that the practice in the Eastern States is to calculate upon an external temperature of 0° Fahr., usually described as "zero weather." The desired average temperature for the corridors, staircases, &c., is from 65° to 68°; and the inmates are not satisfied unless the temperature of their rooms is kept at 70°, which strikes most strangers as unpleasantly warm. The problem which the American ventilating engineer has to solve is, therefore, to satisfy this requirement of maintaining the interior temperature of all public and private buildings at a mean of 70° above the outside temperature, while introducing so much fresh air that the proportion of carbonic acid in the enclosed atmosphere does not rise above 6 (or at most 8) parts in 10,000. This can only be done by means of steam or hot-water heating; hence the open fireplace has been perforce disestablished wherever these requirements obtain, or is at best retained as an ornament and a concession to sentiment.

In the United States, as with us, the effect of the means of lighting employed upon the ventilation of a building, whether public or private, has to be considered; and a fresh aspect has been put upon the subject by the introduction of the electric light—especially in respect of the vexed question of the proper situation of the outlets for the vitiated air. This question was

recently treated as unsettled, in an article contributed by Mr. Leicester Allen to the *Engineering Magazine*. Mr. Allen says that it is high time for some positive decision to be arrived at by ventilating engineers as to whether the entrance for fresh air should be at the bottom, and the exit for vitiated air at the top of an apartment, or whether the arrangement should be reversed, or whether a compromise between the two plans is to be preferred to either used singly. This writer states that about three years ago he was consulted within a short interval by two different Building Committees, to advise respecting the ventilating arrangements of two churches designed by different architects. In one case, the vitiated air was to be removed by means of ceiling openings; and in the other, through registers opening near the floor, and communicating with eduction flues. Each architect believed his plan to be right; and while one based his opinion upon the superior gravity of carbonic acid, which causes it to fall to the ground, whence it can be removed, the other pointed to the effect of heat in causing this and other impurities in the air of a crowded room to rise, and accumulate near the ceiling. The difficulty is one that mainly effects systems of what is called natural ventilation, for with mechanical ventilation the movement of air may be made so positive as to give good results under almost any eduction conditions. Mr. Allen lays stress on the importance of the action of the diffusion of gases as bearing upon this question; and the interchange of heat between gases has likewise something to do with it.

There can be no doubt, Mr. Allen remarks, that the temperature of any gas issuing into an apartment, as well as its specific gravity, has a temporary effect upon its movements. If the gas is warmer than the air into which it issues, while its specific gravity is less, it will rise. If its temperature is less, and its specific gravity is also less, these conditions will oppose each other, and the gas may not rise at all, or may rise very slowly. Again, if its temperature is lower than that of the air, and its specific gravity greater, these conditions will combine to make it fall. Finally, if the specific gravity is greater than that of the air, and its temperature higher, we have again opposed conditions. But the tendency of the gas to expand in all directions is not influenced by its specific gravity, by its temperature, or by pre-existing currents, with the single exception that the higher its temperature, the more rapidly will a gas expand and diffuse. It thus seems plain that "if the rate of expansion of one gas into another is greater than the rate of flow of an existing current, the entering gas will move in an opposite direction to that of the current, which will in such case fail to expel it from an enclosed space. And if it be specifically lighter or heavier than air, its mixture with the air will be correspondingly lighter or heavier than air; and will accumulate accordingly at either the top or the bottom of any enclosed space into which it enters. But if the rate of diffusion be less than the rate of flow in the purging current, the gas must be carried along, notwithstanding its tendency to diffuse in an opposite direction; and in such case there could be no accumulation. To secure perfect ventilation, the rate of diffusion of the noxious gases must be somewhat less than the rate of flow of the air through the enclosure." This is Mr. Allen's contribution to the proper elucidation of the mystery of ventilation puzzles; and it may serve to explain why some arrangements fail to act satisfactorily.

Mr. Wolff remarks that the introduction of fresh air into the top of a room, and exhaustion from the bottom, are only rendered practicable when the lighting is done by electricity, because then there are not only no obnoxious gases to deal with, but also there is no flicker of flames to be guarded against. He holds that the best way to ventilate a crowded assembly-room lighted by electricity is to admit the fresh air through perforations in the ceiling, and remove the foul air by means of openings at or near the floor-level. He calls this the ideal arrangement for securing pure air and moderate temperatures in crowded assemblies during cold weather. Mechanical power is, however, needed to secure the desired result; for the interior atmosphere must be under slightly higher pressure than the external air. For summer conditions, Mr. Wolff thinks the direction of the air currents might be reversed with advantage; and in his own practice he has found it advantageous to have both top and bottom registers for every fresh air flue, and the same for every eduction flue—to be worked either separately or together, as occasion requires. This concession almost gives Mr. Allen all he asks for. It is noteworthy that a similar interchangeability is recommended by Thomas Box, the English adapter of Péclet, who expressly states that "the arrangement of the orifices of access and exit of air must be varied with the seasons. In winter, when the air entering is previously heated, and is of higher temperature that the room, it may enter by one or more openings in any part of the room, and should be drawn off by one or more openings near the ground into the air chimney. In summer the cool external air should be admitted by openings in the floor, and should pass into the chimney by openings near the top of the room, or at least above the heads of the inmates." Mr. Wolff, who manifestly writes from personal experience, which was not the case with Box, expressly states that the object of the ceiling admission of fresh air during the winter is that the air may be cooler, not hotter, than that of the room, and may consequently keep the temperature down without causing a draught.

It may be questioned whether the plan of introducing fresh air through holes in the ceiling of a crowded apartment, and taking the foul air away wholly from the level of the floor, is compatible with lighting the apartment by gas, unless the gas-burners are exclusively of the self-ventilating type. There is an obvious objection to driving down upon the heads of the occupants, prior to removal, all the products of their own respiration, to say nothing of those of the combustion of gas; and for this reason we are disposed to question the quality of Mr. Wolff's "ideal" plan. Many public halls, however ventilated, strike people as draughty in very cold weather, not because of the intrusion of cold air from without, but because the cold walls and roof—especially if the latter is not ceiled—condense the air rising from beneath, and pour it down upon the heads of the inmates in a chilly cataract. The only remedy for this is that practised at the Sorbonne, of deliberately overheating the apartment, for the sake of taking the chill off the walls and ceiling, some time before it is required to be used. When this point is attended to, there remains no real reason why the current of ventilation should be different in winter and summer. The structural arrangements necessary to facilitate the reversal of the course of ventilating currents at will would, in general, be costly and difficult to provide. At the same time, there are considerable advantages in being able to supply and draw off the air at different levels. After all is said, however, upon this and other points of ventilation practice, the fact remains that the efficient ventilation of a crowded hall of assembly, with or without artificial lighting, is not a result that can be arrived at by any "royal road." Theorizing and rule-of-thumb are alike liable to disappoint us if we trust to one method of treatment, evolved from either, for dealing with all cases. Perhaps one of the most troublesome of all ventilation problems is that presented by places of worship and assembly only occasionally used. The engineer who should succeed in keeping the air passably sweet, and the temperature bearable, in a well-attended church, to the last minute of the evening service, summer or winter, would be entitled to rank as a master of this difficult art, and would deserve the gratitude of the community. Domestic ventilation is almost past praying for; but it should not be beyond the power of modern science to enable people to breathe in comfort in places where the populace most do congregate for purposes of duty or pleasure.

Mr. T. Settle, Manager of the gas undertaking of the Knaresborough Local Board, has had his salary advanced; and he is for the future to have charge of the water as well as the gas works.

Mr. Forbes Waddell, Manager of the Blairgowrie Gas Company, has been appointed Manager to the Forfar Gas Commissioners, in succession to the late Mr. Esplin. The matter is referred to by our Scotch Correspondent to-day.

Commercial Gas Company.—Subject to the audit of the accounts of this Company for the half year ended June 30 last, the Directors will recommend dividends at the rate of 13 per cent. on the old stock, and of 10 per cent. on the new stock.

Mr. R. T. Simpson, of Guildford, has been presented with a handsome gold watch and an illuminated address, by the members of the Conservative Club at Rugby (where, it may be remembered, he was engaged prior to leaving for Guildford), in recognition of his services on the Committee; and the latter have elected him a life honorary member of the club.

Death of Mr. David Swallow.—We learn with regret of the death of Mr. David Swallow, of Manningham, last Friday week. Nearly the whole of his life he was connected with the Bradford Gas-Works—both before and after they were transferred to the Corporation; and only a few years ago he retired from active work on a pension of £500 a year. Mr. Swallow had attained the ripe age of 82 years.

Death of Dr. Heumann.—The *Chemiker Zeitung* recently noticed the death, at the early age of 43, of Dr. Karl Heumann, Professor of Chemistry at the Polytechnic School, Zurich. He had just completed the second volume of an important work on "The Aniline Colours and their Manufacture." Among Dr. Heumann's chief original memoirs was one entitled "Contributions to the Theory of Luminous Flames," reference to which has been made on several occasions by Professor Vivian B. Lewes, in the course of his lectures on coal gas.

Death of Mr. Edward Horner.—By the death of Mr. Edward Horner, which took place on the 1st inst., at his residence at Crayford, in his 81st year, one of the old, perhaps the oldest representative of the original gas interest of London has been removed. Deceased was identified with the Phœnix Gas Company; and upon the sudden death of Mr. J. E. Johnson, in 1867, Mr. Horner (who was then Deputy-Chairman) was unanimously elected to the presidency of the Company. This office he filled with great earnestness and assiduity until the amalgamation of the undertaking with the South Metropolitan Company in 1880. Upon his retirement, the proprietors presented him with a testimonial as a record of their good-will and appreciation. Mr. Horner never fell in very heartily with the "modern school of amalgamation;" but in all he did he was a man of high integrity and zeal, and ever careful of the interest and rights of his shareholders and justice to the public. He was Chairman of the Ottoman and Bahia Gas Companies, and a Director of the Antwerp and Seville Water Companies. The funeral took place at Crayford Church last Thursday.

NOTES.

A Point in Sulphur Purification.

An instance of the way in which familiarity with the conduct of a particular set of chemical reactions may enable light to be thrown upon others apparently of a totally different character, appears in a communication by Mr. Chas. W. Folkard to the *Chemical News* on the subject of the action of lithia water on the blood of gouty patients. Dealing with this matter as "an old but flourishing blunder in medical chemistry," Mr. Folkard proceeds to explode the notion that the imbibition of lithia water can possibly exert the action popularly ascribed to it, of dissolving urates out of the human economy; showing that the laws of chemical combination do not admit of such a process. He then goes on to remark that an analogous blunder was formerly committed with reference to coal gas purification, "where gas engineers strove for many years to purify the gas from bisulphide of carbon vapour by means of sulphide of calcium; and, *at the same time*, endeavoured to make the spent lime inodorous by converting it into carbonate before taking it out of the purifier. Here, again, it would have been very convenient if carbonate of calcium could have been induced to combine with carbon bisulphide; but it is hardly necessary to remark that the attempt was a failure." The analogy drawn by Mr. Folkard between what goes on with lithia water in the human stomach and with sulphide of calcium in gas-purifiers may or may not be trustworthy; but if he has succeeded in correcting a failing of medical chemistry by the aid of an illustration drawn from the chemistry of coal-gas purification, it is to be hoped that some time or other the process may be reversed, and the problem of cleaning gas from sulphur rendered the more easy of solution by the conveyance of a hint from therapeutics.

Furnace Gas Testing.

An apparatus for testing furnace gases has been devised by M. Uehling, of Birmingham, Alabama, which utilizes for this purpose the law of the flow of gases through minute apertures in thin plates. It comprises one or more absorption-tubes and connections, according to the number of constituents to be determined; the inlets being connected with the source of gas to be analyzed, and the outlets with an exhaustion appliance working at a constant tension. Both the inlet and the outlet are by a minute aperture. The absorption-tubes are filled with non-corrodible scrubbing material, and connected with vessels containing a sufficient quantity of the suitable reagent solution for absorbing the constituent to be determined. In the continuous and automatic operation of this apparatus, the inlet and outlet connections are so set as to induce a regular flow of gas through it; while the absorbing fluid is caused to drop, at any required rate, into the absorption-tube. Here the fluid meets the ascending stream of gas, from which it extracts the constituents to be measured. By virtue of this action, the tension in the tube—that is to say, the tension between the two minute apertures—is reduced proportionately to the quantity of gas absorbed; and this is registered by a pressure-gauge connected to the arrangement. Hence the degree of tension shown by the gauge becomes a measure of the constituent sought; and since the flow is continuous, the indication must also be continuous, and as the quantity of absorbable gas varies from time to time, so will also the tension vary and be rendered visible. Carbonic acid and carbonic oxide are the two principal constituents of furnace gases to the determination of which this appliance is more particularly directed—the former by absorption by solution of caustic potash, and the latter by a hydrochloric acid solution of cupreous chloride.

Japanese Lacquer as a Preservative of Iron and Steel.

The suggestion has been made—and it is for our paint and varnish manufacturers to ascertain whether or not the idea is a practicable one—that more attention should be paid by engineers to Japanese lacquer for the preservation of structural iron and steel from rust. The general notion respecting this material is that it is only suitable for artistic purposes; but this is said not to be the case. It is employed largely in Japan for an infinite variety of purposes—acid-tanks, coating ships' bottoms, and for articles of domestic use which are capable of resisting hot water, soap, and alkaline solutions. The sap of the lacquer tree is a natural essence, like crude turpentine; and it is described as being vastly superior to any artificial varnish. It hardens into a coating of mirror-like smoothness, never splits or cracks, and is very durable. Instances have been known of specimens of lacquer work that had been sunk in the sea for more than fifty years; and, although covered with barnacles and other marine growths, they were practically unharmed, so perfectly had the lacquer protected their substance. It would be interesting to know whether local gas engineers have ever made use of this protecting material for structures and apparatus usually painted in other countries.

Experiments with Carbonic Acid Gas.

Among some experiments with carbonic acid gas conducted by Dr. Bleckrode, in order to ascertain the behaviour of this compound under a variety of conditions, four precisely similar incandescent electric lamps were prepared—one filled with carbonic acid gas, another with ordinary coal gas, the third with hydrogen, and the fourth was of the ordinary vacuum type. All these lamps were of the 16-candle power size and of the same voltage, and were connected in parallel to a dynamo; and they all carried a small piece of phosphorous on the top, outside the glass. Current was turned on to the lamps at the same moment; and it was observed that the phosphorus became ignited at the different times. It began to burn first on the lamp containing the carbonic acid gas, next on that containing coal gas, and shortly after on a lamp containing hydrogen; but it remained for a long time unignited on the ordinary vacuum lamp. It is inferred from this that the invisible heat-rays are very imperfectly transmitted through a vacuum; while, of course, connection must also be very much reduced. Hence the glass can only receive a very small amount of heat; or perhaps it would be more correct to say, it can only become heated very slowly. Consequently, the carbon filament cannot readily part with its heat; and therefore it converts into radiant light a great deal of the energy it receives. As for the other lamps, in carbonic acid the filament will only become dull red, while in the others it remains obscure; yet the phosphorus is ignited after a minute or two. With the vacuum lamp, it is curious to see the carbon brightly glowing without emitting sufficient heat to set the phosphorus on fire. It appears from these observations that carbonic acid gas must be a good conductor of heat, while even hydrogen conducts heat far better than such a vacuum as exists in incandescent electric lamps. With the latter, it also appears that the vacuum not only preserves the luminous filament, but also contributes largely to its brilliancy.

The Managership of the Market Harborough Gas-Works.—In response to the invitation which recently apppeared in our advertisement columns, the Directors of the Market Harborough Gas Company received 79 applications for the post of Manager; and they unanimously appointed Mr. James Fryer, of the Cradley Heath Gas-Works.

Mr. Featherstone's Paper at the North of Ireland Meeting.—Mr. W. B. Featherstone asks us to mention that, when referring, in the course of his paper on "A Fifty-Feet Diameter Gasholder," read at the recent meeting of the North of Ireland Association (*ante*, p. 424), to a gasholder at present in course of construction at Seaford, Sussex, as a good example of a telescopic gasholder, complete, with steel tank, foundations, &c., he omitted to state that it was designed by Mr. J. W. Helps, of Croydon, and was being erected under his supervision.

Books, &c.. Received.—We have received from the Britannia Company, of Colchester, a copy of the fourth edition of a useful little book lately issued by them on "Turning Lathes." It is larger than its predecessor by 68 pages; and under the editorship of Mr. J. Lukin, M.A., its general contents have been revised, and improved by the addition of several novel features. The work is professedly one for use in technical schools and by apprentices; but there is much in it that will be found valuable by those who take an interest in turning. The text is illustrated by 225 engravings.——"Designing Ironwork." By Henry Adams, M.Inst.C.E., &c., Professor of Engineering at the City of London College. (Published by the author at 60, Queen Victoria Street, E.C.) This pamphlet forms Part I. of the second series of Mr. Adams's work on "The Practical Designing of Structural Ironwork;" and it contains examples of greater magnitude and more importance than those there given. The subject selected for treatment is a steel box girder, for which he furnishes notes, calculations, stress diagrams, and working drawings.——We have received from Messrs. Falk, Stadelmann, and Co., Limited, a copy of the thirtieth edition of their illustrated catalogue of petroleum lamps, stoves, and gas and electric light fittings, &c. It is quite a bulky quarto of 300 pages, in which the firm's specialities—the "Lampe Veritas" and the "Wizard Lamp"—are shown in all the latest patterns.

Gas as a Motive Power in Ceylon.—Recent mail advices bring an account of an experiment which is being made by Mr. A. P. Ingrams, Manager of the Colombo Gas Company, to introduce gas-engines in that part of the globe. Notwithstanding the limited opportunities for such enterprise, Mr. Ingram's perseverance has been rewarded with some success. In the printing office of the *Ceylon Observer*, a gas-engine has replaced the coolie labour by which the machinery had hitherto been driven; and a 12-horse power gas-engine has been ordered for the purpose of generating electric light at the Bristol Hotel. When used as a motive power in Colombo, gas has to enter into competition not only with steam, but with the abundant supply of cheap labour which can be obtained in the island. Gas is not so cheap in Ceylon as in England; nevertheless it is apparently able to hold its own, and perhaps a little more, in comparison with steam or hand labour. The *Ceylon Observer*, which is not a little proud of having the first gas-engine fitted up in the island, gives some figures as to comparative expense. Formerly it cost from 90 to 100 rupees per month for hand labour; and it was calculated that the same amount of work could be obtained from gas at an expenditure of 70 rupees. As a matter of fact, it was found that the gas consumed in the first month cost only 39·90 rupees. To this must be added 8 rupees for rent of gas and water meters and water supply; making a total of 47·90 rupees, or a saving of from 40 to 50 per cent. on the cost of coolie labour. It is suggested that even this may be improved upon.

COMMUNICATED ARTICLE.

ILLUMINATING POWER AND ILLUMINATING EFFECT.

By J. T. Sheard, F.C.S.

It is a circumstance of common observation that the mind is not easily diverted from old-established trains of thought into newer courses; otherwise it might be matter for reasonable surprise that Mr. Newbigging's Gas Institute paper on the above subject has not received more attention, or caused more discussion, in the ranks of the profession than it has done. So bold an expression of views running counter to generally received opinion, coming from so experienced and eminent an engineer, merits at least the most careful attention and intelligent investigation. Believing that the free and full discussion of the subject cannot but be ultimately fruitful of good to the gas industry, I have ventured to put into shape, and string together, the thoughts that have occurred to me as the result of some study and experiment. If they do not add anything to the stock of common knowledge, they may be of service in reviving flagging interest in an important subject.

The main points of Mr. Newbigging's contention are two: (1) That low-quality gas—that is, gas of 14 or 15 candle power, as tested by the photometer—is cheaper and, *under proper regulation*, more efficient for the ordinary purposes of an illuminating agent than gas of higher quality; (2) that illuminating power, as determined by the ordinary photometric test, and illuminating effect, as developed in the lighting of interiors by ordinary burners, are not synonymous, nor, with only our present knowledge, easily convertible terms. With regard to the former, it is a notable circumstance that a reversion to gas of lower quality should be advocated just when new modes of enrichment, promising great economy as compared with former methods, are coming to the front. On this point Mr. Newbigging does not mince matters. "Enriching nostrums," he asserts, "are a snare and a delusion. They are not necessary for effective lighting; they are a backward step in illuminating by means of coal gas."

I confess that Mr. Newbigging's first proposition, taken in its entirety, at the outset and for some time staggered me. But, before proceeding to examine and expound it, it will be well to lay down clearly what I understand as its meaning. I take it that Mr. Newbigging does not mean to declare that 14 candles should be the unvarying standard quality for gas in every town; but he specifies 14 candles because that quality gas can generally be produced without difficulty from the great majority of the gas-producing coals of this country. And, further, he asserts that it is better for the consumer to obtain gas, free from carbonic acid, and of from 14 to 16 candle power, than gas of 19 or 20 candles and upwards, even though the latter could be obtained as cheaply (light for light, tested by the photometer) as the former.

The complete acceptance of the proposition, thus stated, amounts to nothing short of a revolution in the views hitherto generally held. That it should be preferable to consume 6 or 7 cubic feet of gas in order to obtain the same (photometrically determined) result as would be yielded by 5 cubic feet of the higher quality, seems an entire reversal of an established canon of gas lighting. Nevertheless the considerations which I shall set forth as the result of my reading and thinking on the subject, confirmed by careful observation, go to show most forcibly that, in defiance of preconceived opinions, the newer view may also be the truer one.

The remarks on the comparative illuminating effect of large and small luminous sources, and the behaviour of the visual organs towards them, which are contained in the interesting communication published by Mr. Newbigging in last week's JOURNAL (and which have appeared since I commenced to write this article) have forestalled much that I had to say on this head. With the whole bearing of those remarks I am in entire agreement. They do not, however, exhaust the subject in its physiological aspect. The eye, as an organ of vision, is not perfect. When the pupil is contracted to look upon an intense light, it is less able immediately to perceive a feebler illumination. "By the action of light, the optic nerve is rendered less sensitive. When we pass from bright daylight into a moderately lighted room, the room appears dark."* So in bright sunshine, the parts in shadow look less brightly illuminated than they really are. When the eye can perceive the light-source as well as the surfaces illuminated, the effect is heightened in proportion to the intensity of the light. Conversely, a room lighted by several sources of illumination of moderate intensity will appear better illuminated and more agreeable to the eye than one with fewer light sources of higher intensity, although the mean illumination may be the same. In fact, after sufficiency of light to see things clearly has been provided, contrast has much to do with the opinions we form as to the efficiency of artificial illumination; and that lighting will be most satisfactory in which the differences between ill and well lighted surfaces are reduced to a minimum.

The operation of the same law may be seen in the higher standard of interior lighting that has become general of late years, especially with regard to shops and places of resort for business and pleasure. The lighting of even the meaner class of shops is generally much improved. This demand for more and better artificial illumination is distinctly traceable to the introduction of electric arc lights and high-power gas-lamps for the illumination of streets and open spaces, and the invention of the regenerative burner, which provided more intense centres of light than had been before available. Compared with these more powerful light-sources, the standard of illumination that was hitherto thought high enough appeared low, and there was a natural craving on the part of the eye for a more generally improved illumination.

Let us apply these considerations to the subject in hand. In burning low-quality gas, we obtain, for the same illuminating power, larger flames than with gas of higher quality—that is, more luminous surface; consequently, there is better diffusion of light and the reduction of shadows. Then it is an axiom in burning gas that the more we consume properly in a flame (or, what amounts to the same thing, the larger the burner employed) the higher duty is obtained from the illuminant; so that low-quality gas is more economically consumed. Moreover, with the latter, a lower pressure may be employed at the point of ignition, without risk of smoking; producing a light more agreeable in colour to the eye, and containing a greater proportion of the most luminous rays of the spectrum. The low-quality gas is therefore preferable to the high, because its combustion in ordinary burners affords increased luminous surfaces of lower intensity and more agreeable colour; while with suitable appliances (regenerative and incandescent burners) a higher intensity is obtained at will. On the other hand, the bright light of rich gas-flames cannot economically be reduced in intensity without causing smoke and consequent nuisance.

It may be urged, in opposition to the argument that has been advanced, that, whereas the combustion of low-quality gas generally means obtaining a light of low intensity, a more intense and whiter light is to be preferred, because the more intense the light the more closely does it approximate to daylight in revealing all the colours of the spectrum. On this connection, or relation of the colour of luminous flames to their intensity, there is much to be learnt. Well-directed research in this field might be productive of valuable results. It may be that the colour of the light evolved from incandescent carbon in a gas-flame necessarily varies with its intensity; and that, to alter the one without affecting the other, would necessitate the introduction into the flame of some other combustible substance. This much, however, is certain, that in not all light sources is there the same relation, or is the relation in the same degree. For instance, the intensity of the luminous surface in an electric incandescent filament is a hundred times that of a common gas-flame, while its colour is much the same. This comparison is rendered a somewhat doubtful one by the fact that, in the electric lamp, we have a fixed amount of glowing surface which can be measured; whereas in the gas-flame, there is not an actually continuous incandescent surface, but a multitude of glowing points or specks in rapid motion, which by irradiation appear to the eye as one entire surface. In fact, the whole subject is beset with difficulties, needing some courage to encounter in even the feeblest manner. The drift of my meaning in doubting the necessary connection between intensity and colour of light, and suggesting the possibility of correcting one without altering the other, may, however, be indicated by illustrations based upon the correspondence existing between the generally accepted theories as to light and sound.

"Colour is to light what pitch is to sound. The pitch of a note depends solely on the number of aerial waves which strike the ear in a second. The colour of light depends on the number of ethereal waves which strike the eye in a second." Thus red, blue, and yellow rays correspond to different tones; and the combination of them in the yellow light of candles, the whiter light of gas, greenish white of the Welsbach, and the bluish white of the electric arc may be likened to chords. Now just as we combine the same chords from a number of musical instruments to produce one sound of overpowering loudness, but maintaining the same pitch, so may we combine a number of impulses of the same series of light waves to obtain a light of extreme intensity, without affecting its colour. Thus the light given off in a horizontal direction from an Argand gas-flame embraces the rays from two sections of flame, and is consequently of double the intensity it would be if an opaque screen could be interposed, cutting the flame vertically into two portions. But does not the colour remain the same?

Take another illustration. Intensity of light corresponds to loudness of sound, and is dependent, in each case, upon the amplitude of the vibrations—that is, of the distance to which the particles move to and fro. In other words, it is a consequence of the *force* with which the ethereal or aerial particles are set in motion. Imagine now an organ-pipe, blown with tremendous force, producing a sound of surpassing loudness. The same volume of sound might be produced from a number of the same pipes blown less loudly. A listener so placed that the sound reached his ear with the same loudness in each case, would be unable to distinguish between the two, supposing each instrument to give out its note at exactly the same pitch, and having the same *timbre*. Translating the illustration into the phenomena of light, we might have, on the one hand, a luminous surface of limited dimensions but extreme intensity, and, on the other hand, a number of lights, each having the same area of luminous surface, but of lower intensity, so arranged as to afford

* Tyndall, "Notes on Light," p. 39.

the same amount of illumination at one point as the more intense light. In the one case, we should say that *quantity* of light predominated; and in the other, *intensity*. The volume of illumination at the observer's standpoint would be the same in both cases; but there can be no doubt that the impression produced upon the eye would be widely dissimilar. What is wanted, then, in improved lighting, is to aim at reducing the intensity or *loudness*, multiplying the quantity, and heightening the colour or *pitch* of the luminous surface. It is, I take it, because low-quality gas permits of obtaining the two former conditions that it is to be preferred. In the Welsbach light, there is higher range of colour, combined with greater intensity; which latter is ten times that of the ordinary gas-flame. If, now, instead of so great an increase in intensity, the *quantity* of light—or extent of luminous surface—could be increased in the same proportion, while its colour remained the same, can it be doubted that a far more satisfactory illuminant would be obtained?

A principal objection that will be raised against the proposition that low-quality gas is preferable to high, is that the heat and carbonic acid produced by its combustion are greater for the same illuminating power developed. This objection has the less force—nay, is almost converted into an argument in favour of the change—now that gas is so extensively used for cooking, heating, and producing motive power. Ventilation is needed to remove the products of combustion in any case; and such increased quantity as might be produced could not necessitate any radical alteration in this respect. Besides, it must not be overlooked that the whole tendency of the above remarks goes to show that, with a more diffused and equable illumination, the total illuminating power employed need not be increased, but in many instances may, with advantage, be reduced. The same room is better lighted by two gas-flames, each of 15-candle power, than by one oil-lamp of 35-candle power. On this point I may enlarge when I come to consider Mr. Newbigging's second proposition, which I must make the text for another article.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Twelfth General Meeting of this Association was held on Thursday last, at Great Yarmouth, under the presidency of Mr. W. J. Carpenter, Assoc.M.Inst.C.E., the Engineer of the local Gas Company. The attractions of this seaside resort, the remembrances of the hearty welcome and thoughtful arrangements made for the comfort and pleasure, of the members when they visited the town in 1890, and the promise of a good programme of combined work and pleasure, brought together a large number of the members and many friends. The meeting was held at the Royal Assembly Rooms, where, before entering upon the business, the visitors, by the invitation of the President and the Directors of the Gas Company, partook of a generous luncheon. After a short interval, the members settled down to work. The proceedings commenced by

Mr. W. Palgrave Brown, the Secretary of the Southtown (Yarmouth) Gas Company, offering the Association a very hearty welcome to Yarmouth. He briefly referred to the advantages of a visit to this celebrated watering place, which, he thought, would compare with any other seaside town in the kingdom. He expressed the hope that the members one and all would receive instruction and interest from the meeting.

The President thanked Mr. Brown, on behalf of the Association, for his kind remarks, and added that, in his dual capacity as President of the Association and a resident in the town, he was pleased to see the members there; and he emphasized Mr. Brown's wish that the meeting might be a profitable one.

Minutes of Last Meeting.

The Hon. Secretary and Treasurer (Mr. H. Wimhurst, of Sleaford) submitted the minutes of the meeting held at Bury St. Edmunds, on April 18 last; and on the motion of Mr. C. W. Grimwood (Sudbury), seconded by Mr. J. H. Troughton (Newmarket), they were confirmed.

Admission of New Members.

The Secretary proposed, and Mr. G. King (Halesworth) seconded, the election of the following gentlemen as members of the Association: Mr. F. H. Wood, of Harlow; Mr. R. Vince, of Stowmarket; Mr. D. Bloodworth, of Ketton; and Mr. W. How Butler, of Long Sutton.

The proposition was agreed to.

Mr. W. D. Child (Romford) then read the following paper:—

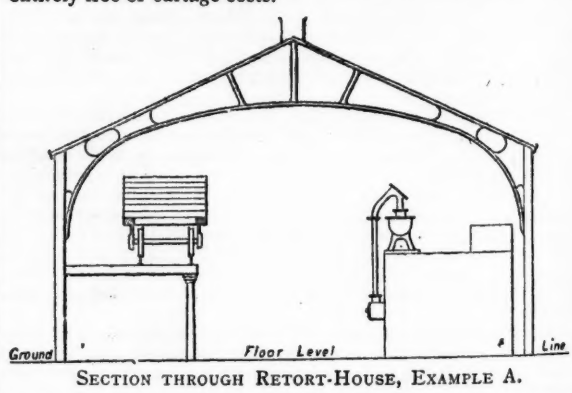
RETORT-HOUSE CONSTRUCTION.

In preparing this paper on retort-house construction, permit me to state at the outset that I have purposely abstained from expressing opinions. My object has rather been simply to furnish data that we may be the better enabled to arrive at the comparative cost of the different methods employed in the erection and fitting of retort-settings and furnaces. It will be equally interesting if we further endeavour to ascertain how far the increased outlay involved in the more modern system of gaseous firing is justified by the results obtained. Every member of this Association has had more or less experience in these matters; and I am, therefore, led to hope that a full and free discussion of the subject cannot fail to elicit information which will prove alike interesting and useful.

For some time prior to the year 1891, the writer had been engaged in preparing designs for a proposed new retort-house. Owing to the limited requirements of the neighbourhood to be served (a maximum make of about 150,000 cubic feet per diem), and a desire to keep down the expenditure as low as possible, he had decided that a ground-floor house, with settings of six retorts in each arch, heated by ordinary open-grate furnaces, would (if substantially and economically built) be most suitable for obtaining good general working results. By good results are meant a fair yield of gas per ton of coal carbonized, according to the quality of coal used; a proportionately low consumption of fuel; and an avoidance of undue wear and tear in retorts and settings. For although high heats will naturally produce a large quantity of gas per ton of coal, and with some descriptions of coal (it is also possible) increased illuminating value, yet these are advantages which are liable to be counterbalanced by the great trouble and inconvenience arising from stopped ascension-pipes, by an excessive expenditure of fuel for heating the retorts, and finally by the speedy destruction of furnaces and settings.

As the time approached for commencing the work, the Directors of the Company seemed desirous of making some advance upon the system then in use; and this desire, coupled with increasing business, appeared further to justify the adoption of more modern methods, even though it meant increased capital outlay. Plans and comparative estimates were, therefore, prepared for several distinct types of retort-houses and settings; and, in submitting the figures relating to them for your consideration, it is not intended to offer them as examples to be followed. Having, however, been carefully prepared for the same site, and practically for the same class of work in each case, they are estimates which may be taken as fair comparisons of the cost of such structures, when designed for the different systems of working that are now employed.

It will be well to state at once that the site to be built upon afforded excellent natural foundation, and that direct communication with the railway had been secured by a short siding connecting the main line with the Gas Company's premises. As a result, all building material was delivered upon the site entirely free of cartage costs.



Section through Retort-House, Example A.

The original design (Example A) was for a ground-floor house, 113 ft. by 44 ft. 6 in. within the walls, and 20 ft. high from the floor to top of the walls. The roof principals were arched wrought-iron ribs, resting on, and secured to, vertical H-iron standards placed 10 ft. 6 in. apart; the intervening spaces being filled in with 9-inch brickwork. The roof covering was to be of galvanized iron, No. 16 B.W.G., with 5-inch corrugations; and the floor of the house was to be laid with Yorkstone to within 6 feet of the retort-bench—the remainder to be paved with suitable bricks. The house was intended to be fitted with eleven arches, each containing six retorts to be heated by ordinary open-grate furnaces. This building, with a concrete base for the retort-bench, was estimated to cost £1180.

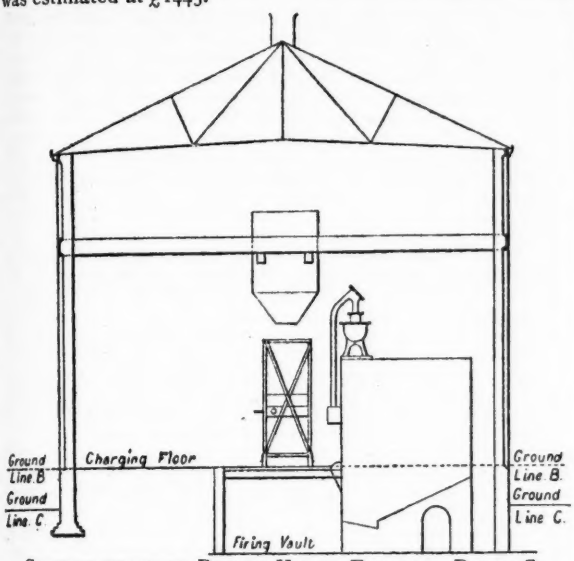
Arrangement was made in this house for the cast-iron columns and wrought-iron girders, carrying the railway through the coal-store 10 feet above the floor-level, to be continued the whole length of the retort-house, in order that coals might be delivered directly opposite each setting of retorts as were to be worked for the time being. But as this item does not appear in the other examples, the cost of this portion of the work is not included in the estimate given.

The retorts were to be charged by the shovel during the summer months, when only two stokers are employed in the house; and with the scoop during that part of the year when three men were at work on each shift.

Example B was for a ground-floor house, 113 ft. by 40 ft. inside the walls, and 30 ft. high from floor to plate; the additional height being given to afford accommodation for West's manual stoking machinery, with coal elevators, hoppers, &c.

The walls were to be substantial erections of stock brickwork, arranged in piers and panels, with plinth course, arches, door jambs, sills, and an oversailing eaves course of Staffordshire blue-bricks; and the roof consisted of trussed wrought-iron principals, spaced 10 feet apart, covered with galvanized iron, 16 B.W.G., with 5-inch corrugations. The floor was to be of Yorkstone and hard brick paving as in Example A.

This house would provide space for eleven arches, with 66 retorts, each 21 inch by 15½ inch, D-shaped, and also for two chimneys standing within the walls at either end of the bench. The building, with a concrete base for the retorts and chimneys, was estimated at £1445.



SECTION THROUGH RETORT-HOUSE, EXAMPLES B AND C.

Example C was for a retort-house with coal-store at one end, forming a block of building 181 ft. 3 in. by 44 ft. 9 in. outside measure. The dimensions of the coal-store were 60 ft. by 40 ft.; and as it was fitted with column and girder work to carry the railway waggons 10 feet above the floor-level, the storeage capacity was 500 tons.

The retort-house, as in the preceding cases, measured 113 ft. by 40 ft. inside; and 30 ft. 6 in. high from the charging-floor to the top of the walls. Below the charging-floor was a vault 11 ft. 6 in. wide by 8 ft. high, and running the entire length of the house, to give access to the regenerative furnaces to be used for heating the retorts. Entrance to the vault was provided by stone steps from the retort-house floor, or by an incline from the yard-level. The floor of the retort-house was to be 4 feet above, and the floor of the vault 4 feet below the natural ground-level.

The style of brickwork and the roof was exactly similar to that described in Example B, with the addition that the retaining wall of the vault and the external walls of the house up to 4 feet above the ground-line were to be built in Portland cement concrete. The solid portion of the floor was to be paved with Yorkstone, laid on 6 inches of cement concrete. The part of the floor extending over the firing-vault had a strong framework of wrought-iron joists, one portion of which was to be covered with cast-iron plates. The remainder was to be formed of curved corrugated galvanized plates, sprung in between, and resting upon, the bottom flanges of the joists; and these were to be then filled in with good Portland cement concrete to the floor-level.

The writer finds the concrete flooring preferable to cast-iron plates, as with the latter, water that is used in slaking the coke inevitably percolates through the joints and crevices, and thus keeps the joists forming the supporting framework wet and dirty. On the other hand, the concrete covering secures a perfectly clean underside, and so preserves the framework from immature decay. Further than this, the concrete affords a cooler, and at the same time more secure, footing for the workmen. If a paving of hard brick be laid on the concrete, it forms a really first-class and most durable piece of work; but in the case under consideration, the surface was finished with fine concrete.

With regard to the roof, galvanized iron as a roof covering in gas-works in generally condemned; but where good material has been used, I have seen it after fifteen years' use without showing any sign of decay.

The buildings, as designed, are unusually lofty; and thorough ventilation is secured by an opening 2 feet wide at the apex of the roof, and extending the whole length of the ridge. Driving rain or snow is kept out, by a vertical plate, 2 feet high, placed on each side of the opening. By this arrangement, smoke and steam can rapidly escape; having to encounter no obstruction, as is the case when a raised ventilator, with side louvres, is used. No inconvenience has been experienced in the most stormy weather; and the roof framing and under side of the plates are kept dry and comparatively free from deposit. Corrugated plates are almost self-supporting, requiring but few purlins, and the roof covering, even with 16-gauge plates (approximately 380 lbs. per square), is not half the weight of slates and L iron battens, enabling principals of equal strength to be spaced 10 feet apart, instead of from 5 to 6 feet. The fastenings of slates are as liable to decay as is the plate covering; and it is questionable whether repairs to a slate roof are not the most expensive.

The saving of expenditure on the roof in question was about £300; and, if the interest on this amount were capitalized, it would pay for replating the roof long before the time arrives when it will be necessary to carry out such work.

The estimate for this building—including the concrete base for the retort-bench and chimney—was £2530; and as this plan was selected and carried out, I will, with your permission, give a summarized statement of the cost of the completed work—

Building contract, including all earthworks, concrete, brickwork, masonry, and woodwork				£1512	0 0
Extras on the above				11	7 9
Iron roof for the entire block				602	0 0
Railway on columns and girders 10 feet above the floor of the coal-store				127	0 0
Iron floor over the firing-vault				238	16 0
Concrete floor opposite the engine-room				29	0 8
Coal-house floor				19	4 10
Copying plans, specifications, and sundries				20	15 10
Total cost covering all contracts, and also work done by the Gas Company				£2560	5 1
Deduct for coal-store, 500 tons capacity—					
Builders' work	£288	3 0			
Roof	200	0 0			
Floor	19	4 10			
Railway	127	0 0			
	£634	7 10			
Deduct for engine-room	64	0 0			
				698	7 10
Cost of retort-house to compare with A or B				£1861	17 3

It will be seen that the actual cost of carrying out the selected plan, C, was £2560; being only £30 in excess of the estimates. As the other estimates were worked out with equal care, the several figures applying to them may be taken as being nearly correct; and they serve to show that the cost of the different retort-houses, each equal to a production of from 300,000 to 350,000 cubic feet per diem, may be summarized in the following manner:—

Cost of Retort-House Complete, with Concrete Base for Retort-Bench and Chimneys.

EXAMPLE A.—Ground-floor house as described, suited for ordinary open grate furnaces									£1180
EXAMPLE B.—Ground-floor house as above, but adapted for stoking machinery									£1445
EXAMPLE C.—Stage-floor house as described, suitable for regenerative furnaces and for manual stoking machinery									£1862
	Per 10 Feet Lineal.			Per Setting of Retorts.			Per Mouthpiece.		
EXAMPLE A =	£100	8 0	..	£107	5 0	..	£17	18 0	
" B =	£123	0 0	..	£131	7 0	..	£21	18 0	
" C =	£154	0 0	..	£169	5 0	..	£28	4 0	

As seven retorts are now being put in the arches, in place of six, the cost of the house per mouthpiece will be proportionately reduced.

Let us now pass on to a consideration of the retort bench and fittings. When the cost of this part of the plant is given, and also an estimate for a retort-bench with ordinary furnaces, we shall be in possession of figures from which calculations may be made as to the relative value of the several systems from a profit-earning point of view.

The regenerative furnaces used in the settings were built from designs furnished by the late Mr. John Somerville, who most kindly assisted me in that portion of the work. He had devoted many years to this system of heating retorts; and the experience gained by his work was most liberally placed at my disposal. The house, as already described, is intended for a retort-bench of eleven arches; but up the present time, only eight have been built and fitted up. The arches are semi-circular, 8 feet wide in the clear, and 16 feet high from floor to centre of arch. The division-walls are 18 inches thick. The main flue, at the bottom of the setting, has an area of 11 feet, and runs into a chimney placed at the end of the bench. The chimney is 54 feet high, and has an internal area of 9 feet. The brickwork is 14 inches thick for a height of 25 feet; the remainder being 9-inch work. It is bound together by angle-irons placed vertically at each corner, and belts of flat iron bolted together at intervals of about 10 feet. When the eleven arches are erected, it is intended to build an additional chimney at the other end of the bench.

The cost of the work was as follows:—

Fire bricks, tiles, and clay		£559	3 1
Stock bricks		93	1 6
Lime		10	12 6
Cement		11	19 11
Retorts		104	11 5
Cartages		2	13 3
Ironwork, including buckstaves, tie-rods, mouthpieces, ascension, bridge, and dip pipes, and hydraulic main		373	2 7
Labour building arches, furnaces, and chimney, setting retorts, and erecting ironwork		387	16 9
Total		£1543	1 0

Total cost from foundation to outlet-valves of hydraulic main, £32 3s. per retort.

The cost of the regenerative furnaces from the floor of the firing-vault to the level of the bottom retorts—including labour, brickwork, and iron furnace work—was £50 2s. 6d. each. If the retort-stack had been 8 feet less in height, and constructed with ordinary open-grate furnaces suitable for houses A or B, the cost would have been only £1130. It, therefore, appears (from the figures already given) that to construct a house 113 feet inside length, with two chimneys, each 54 feet high, and a retort-bench for 66 retorts fitted complete to the outlet of the hydraulic main, and equal to a production of 350,000 cubic feet per diem, the outlay would be as under—

	Example A. Ground-Floor House for Scoop Charging and Open-Grate Furnaces.	Example B. Ground-Floor House for West's Manual Stoker and Open-Grate Furnaces.	Example C. Stage-Floor House for West's Manual Stoker and Regenerative Furnaces.
Retort-house as described . . .	£1180 ..	£1445 ..	£1862
Retort-bench, eight arches . . .	1130 ..	1130 ..	1543
Three extra settings to complete .	423 ..	423 ..	580
One extra chimney	70 ..	70 ..	70
Total	£2803 ..	£3068 ..	£4055

Examples B and C are the most suitable for purposes of comparison; and we find that, to obtain the advantages arising from the use of regenerative furnaces in a retort-house of the capacity under consideration, an increased capital expenditure is required amounting to £987, on which interest equal to about £50 per annum has to be earned before any benefit is experienced for the increased outlay.

When considering the question, the points that weighed with me in favour of gaseous firing were: (1) The saving to be effected in the coke used for heating the retorts. (2) Reduced wear and tear of retorts and furnaces. (3) Increased length of time that a setting may be kept at work without requiring to be let down for re-furnacing. (4) The fact that the control of the heats is taken to a great extent out of the hands of the stoker and rests with the superintendent.

Experience has shown me that, while the regenerative furnace and stoking machinery have the advantage that they may "at a pinch," and for a limited period, be worked by any able-bodied man, to obtain best results they require a more intelligent attention on the part of the stoker than the old system. As the men are trained to obtain these results by a skilful and expert use of the plant under their charge, they are led to take more interest in their work, and pride in themselves; and, if this can be attained, it is well worth attempting.

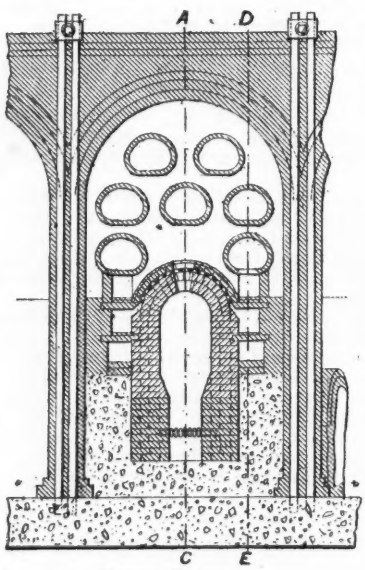
Time is necessary to gain experience in the proper working of these furnaces; and their beneficial effects will be noticed, not only in carbonizing results, but in wear and tear of plant, and in cost of labour. One setting that I have had in use was run continuously from Dec. 9, 1892, until June 12, 1894—a period of 550 days. It was then put out of use, in order that the producer and flues might be examined, and receive necessary repairs before being used during the coming winter. It was remarkable how little destruction had occurred, taking into consideration the length of time the furnace was in use. The same setting will be lighted again about December of the present year; and it will probably be kept in use until the retorts are worn out. In fact, I see no reason why these furnaces should not be built in such a way that they may be lighted and kept in use as long as the retorts themselves will last. I do not wish to infer that results have been all that I anticipated; but they are in the right direction, and will improve with further knowledge.

The labour of the stoker is undoubtedly reduced; but a considerable amount of extra care and trouble in the control of the retort-house are thrown upon the manager. In large works, this would fall upon the carbonizing foreman; but in small works, the manager must anticipate that additional demands will be made upon his time, as the adjustment of air-slides and dampers cannot be left to the stoker, or he will most likely convert gaseous firing into direct combustion, and bring down the setting.

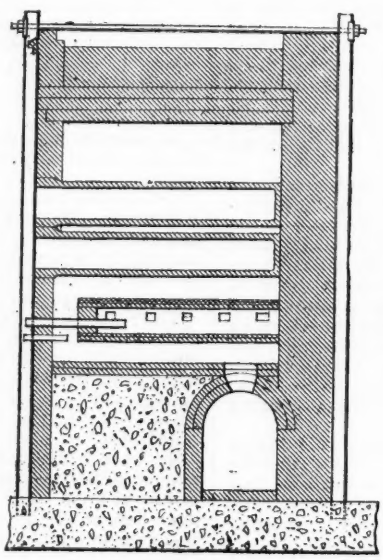
The most persistent and serious trouble has been the cracking of the walls between the secondary-air flues and the producer—allowing an excess of cold air to pass into the furnace. This causes waste of fuel, and excessive heat in the furnace, leading to the rapid destruction of the walls of the producers if the cracks are not speedily stopped. With the hope of overcoming this defect, I am about to build a furnace in which the arrangement and position of the flues will be altered so that the walls of the producer may be built not less than three half-bricks or 14 inches in thickness, instead of only 9 inches as now being used. There will be but one secondary-air flue, with a waste-gas flue above and below; and the secondary air will be further heated on leaving the flue, by passing on its way to the combustion chamber, through an annular space formed above the furnace arch, by covering the latter with studded bricks similar to those used for covering steam-boilers. This I am aware is not in accord with the true principles of regeneration; but if I can succeed in supplying the secondary air sufficiently heated to assist in burning the producer gases, and at the same time prevent air passing into the producer by any other way than the proper primary-air inlet, I believe that the arrangement will prove economical both in construction and in use.

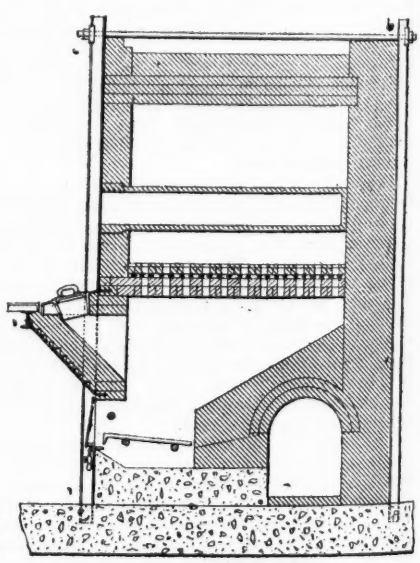
The use of different floor-levels for the furnaces and for the retorts is disadvantageous in small works; for the reason that, where the same men have to draw, and charge, get in coals, wheel the coke, and attend to the steam boiler, engine, and exhauster, the removal of the furnaces into a vault beneath the floor, where the greater portion of the work has to be done, is calculated to lead to their neglect. In large works, this does not apply, as special men are engaged as furnace men; and their duties are confined to that particular floor. But in designing a small house, it is a point worthy of consideration.

The figures given below show, to some extent, the results that have attended the change from direct to gaseous firing; but the whole of the advantages cannot be so clearly set out.



FRONT ELEVATION.


SECTION ON LINE D E.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The extent to which charges for labour, and repairs to plant will be affected by the new system, can only be fairly demonstrated by several years' working. The statistics given are for the year ended Dec. 31, 1891, when we were working with ordinary open-grate furnaces, and using South Yorkshire coal, charged into the retorts with shovels; and for the year ended Dec. 31, 1893, the first complete year's work with regenerative furnaces, and using one-third Yorkshire coal and two-thirds Durham coal, charged into the retorts with West's manual stoking-machine. The difference in the quantity of gas made per ton is not very marked; but it must be borne in mind that, during a good part of 1893, a description of coal was used inferior to, and costing at least 3s. per ton less than, that used in 1891. The principal saving effected was in the quantity of coke used as fuel. This was brought down from 26 lbs. to 16 lbs. per 100 lbs. of coal carbonized—thus saving 10 lbs. of

coke for each 100 lbs. of coal used, or equal to 2 cwt. of coke (value, say, 1s. 6d.) on each ton of coal.

		1891.		1893.
Gas made per ton of coal carbonized . .	cub. ft.	10,035	..	10,094
Average illuminating value of gas supplied.	candles	15·8	..	15·6
Gas accounted for per ton of coal . . .	cub. ft.	9,477	..	9,439
Total gas unaccounted for	„	1,962,000	..	1,902,500*
„ „ „ per cent. on make .		6·4	..	8·31
Coke used as fuel	chaldrons	1312	..	762
„ „ „ per cent. on make		41·30	..	27·0
„ „ „ per 100 lbs. of coal carbonized lbs.		26·01	..	16·1

Since the completion of the work, I have received many inquiries (both personally and by letters) as to the results obtained, also as to cost. Should the contents of this paper, or any further information that may be elicited in the course of discussion, prove of service in the future to any member of the Association, I shall be amply repaid for any trouble I have taken in the matter.

Discussion.

The PRESIDENT, in inviting discussion, remarked that the paper was full of interest and instruction; and it would be very useful to members in planning new retort-houses.

Mr. A. MITCHELL (Bury St. Edmunds) thought the paper had been written quite as much with the view of imparting information to the members as for the purpose of raising criticism. Mr. Child had shown them how he had built a retort-house, and how he had put it to the very best use that could be made of it. He did not think there was very much to be said about the house, with this exception—that, after Mr. Child had decided to go in for regenerative furnaces, he built his house suitable for them, and for the mechanical appliances which he later on put into it. Regarding the cost of the house, he should imagine, taking it all through, that it was economically built, and that the lines Mr. Child laid down were such that the members of the Association, if they were compelled to build a house under similar circumstances, would do well to copy. He quite agreed, from experience of many years ago, with Mr. Child in his observations as to the roof of the house. There was no necessity whatever for the heavy retort-house roofs they found in some parts of the country. Mr. Child was, in his opinion, thoroughly right in adopting corrugated iron and light framework for the roof. Some years ago he (Mr. Mitchell) was acquainted with a retort-house roof that was built on the principle of the trussed framework of a gasholder roof—it was precisely similar—with an exceedingly light cover of flat galvanized iron. He thought, however, he should prefer corrugated iron. He did not remember the exact cost of the roof he referred to. But it came out very cheap, and was perfectly effective; and as good as a retort-house roof heavily made and covered with slates. Even if a corrugated iron roof became worn out in fifteen years, it was cheaper than putting up the expensive framework required to carry heavy slates; and this would be found to be a fact by anyone who had the opportunity of trying it. In small works, it would be found a great advantage, where they had a corrugated iron roof, to wash it down (say) once a year, and give it a coat of black varnish. He had had experience of varnishing roofs, and now he had begun to use tar; and it was a fact that the roof was scarcely damaged in any way from one summer to another. The cost of the retort-bench and the details as to the expense of constructing regenerative furnaces, and the author's preference for them, were amply justified by the figures which he gave at the end of the paper. He did not know of a more certain proof regarding the benefits he had reaped than the large saving in coke. He was not satisfied with percentages; but he had stated the fact that, taking one year with another, he had saved 550 chaldrons of coke, which he supposed would work out to a saving of from £200 or £300 a year. This, as he had said, amply justified his preference for regenerative furnaces, apart from any other argument that he had introduced in the paper. He believed that Mr. Child's works were of medium size; but he did not think he mentioned the output in the paper.

Mr. CHILD: About 160,000 cubic feet per day in the winter.

Mr. MITCHELL (continuing) said he thought that it was very straightforward of Mr. Child to tell the members of his difficulties as well as of the great benefits he had derived from these furnaces. In small works, they could not have a thorough carbonizing foreman; and for a man to take all the work entailed by these furnaces on his shoulders, as well as his other duties, was a great deal. He (Mr. Mitchell) had had no actual experience with regenerative furnaces to be able to say whether or not Mr. Child was successful with his new arrangement; but one question occurred to him as to whether he gave the air sufficient travel.

Mr. J. T. JOLLIFFE (Ipswich) said that, if he were commencing to erect a retort-house, he should not do so on the lines on which the author of the paper started. He (the speaker) did not believe in galvanized iron roofs, but preferred the old-fashioned slates. He should also put more strength in the walls of the house than Mr. Child had done. With regard to the regenerative portions of the settings, he had himself put up, and had had some experience with, regenerative furnaces. He noticed that the author's saving of fuel was marked; and he should like to ask whether this was entirely due to the regenerative furnaces or to the greater number of retorts in the setting. He saw by the drawing that they contained seven retorts in each setting; and this might have something to do with the matter. Looking at the regenerator, he did not think that the full effect of regeneration was carried out; and it was a question whether more might not be done than Mr. Child had accomplished. The amount of coke sold worked out to about 10 or 11 cwt. per ton of coal carbonized. With a setting of seven or eight retorts, using Durham coal, and without regeneration, they would expect to sell that amount of coke; and it seemed to him rather to point to the fact that Mr. Child was not doing all that could possibly be done with the regenerative system. There was also one other matter he should like to mention, and that was as to the size of the retorts. He noticed that a 21 in. by 15½ in. retort was the common size used with West's machinery. He thought that the depth of the retort was too great; and, to him, this appeared to be the blot—and the sole blot—on West's system. The superheating of the gas led to much trouble with stopped pipes. He (Mr. Jolliffe) was trying to reduce the size of the retorts to 21 in. by 14 in.; and he believed it was even possible to do better than that. When he was in the North of England, they used 18 in. by 14 in. retorts; and they were charged so full that there was just space enough above the coke to get the rake over to draw the retorts; and there stopped pipes were almost unknown, although the heats were very high, and the charges were well burnt off. He thought that managers contemplating the adoption of West's system should inquire whether the depth of the retorts could not be reduced.

Mr. J. E. BUCKLE (Woodbridge) asked the author whether the nostril holes in his setting were in the centre of the arch.

Mr. CHILD replied that they were.

Mr. BUCKLE remarked that he had a ground-floor house; and he had got the regenerative system at work, but not with regenerative furnaces. He found that they saved about £20 in coke in one winter, without going to the enormous expense of regenerative furnaces; and he therefore very much questioned whether the expenditure on them was equivalent to the results realized. He had not the least doubt Mr. Child's setting was a good one; but he could not see, if they could obtain from 10,000 to 11,000 cubic feet of gas per ton of coal without regenerative furnaces, that the outlay on them was profitable.

Mr. A. DRAGE (East Dereham) observed that he understood the author to say that the design for this setting was furnished to him by the late Mr. Somerville. Some four or five years ago, he also had designs from Mr. Somerville. They were then working regenerative furnaces with water trickling down the bars; but Mr. Somerville altered all that. He said the fire should be completely on the earth, and worked with steam. At that time, they were working a setting of three; and they afterwards adapted this plan to a setting of six. Since then he had written to Mr. Somerville's son; and it appeared that he had returned to the bars with water trickling down. He was afraid that, in the late Mr. Somerville's plan, the heat had too great a distance to travel to do its work properly. He found that the top retorts got hot, but not the bottom ones. The setting had been modified; and the heat did not travel one-quarter of the distance that it did in Mr. Somerville's old setting. He thought that, if managers of small works would adopt these regenerative furnaces—especially when working with one man—they would find them an advantage, because his experience showed that they could be left longer than the ordinary settings. The latter could not be left more than two or three hours; while a setting on the regenerative plan could be left six hours.

Mr. W. J. BEST (St. Ives) said the author had contended that it was not altogether advantageous to use high heats; but he (the speaker) could never get his heats too high. There would be no difficulty from stopped ascension-pipes providing they kept them 8 inches away from the brickwork; and if a small quantity of water was introduced into the pipes, as proposed some time ago by Mr. Crowe, of Wellington, there would be no difficulty in keeping them clear.

Mr. CHILD, in replying to the discussion, said he was much obliged to Mr. Mitchell for, to a certain extent, corroborating his views as to the usefulness of galvanized iron for retort-house roofs. He had always been of opinion that there was a considerable amount of money expended on heavy trussed iron roofs—more than was absolutely necessary. The iron roof he spoke of as having been in use fifteen years was over an oxide-shed, and was constantly exposed to the fumes from the oxide in its recovery; and this, he thought, was a very good test indeed. He had seen these roofs in use in South Wales and the Colonies; and always with good results in regard to their durability. If the iron was of sufficient substance, and was really good iron, and corrugated with 5-inch flutes, which did not buckle up so much as with 3-inch flutes—especially if the house was as lofty as the one he had spoken of, and as well ventilated—then he felt sure that anyone adopting this form of roof would be well satisfied with it. Mr. Mitchell also referred to the saving of coke as being 550 chaldrons in preference to stating the percentage; and he (Mr. Child) agreed that this did readily show where the saving came in. Mr. Jolliffe alluded to the strength of the walls of the house; but he was afraid that gentleman had mixed the two examples. In the first example, he mentioned that the whole structure had an iron framework; and the roof

* Regarding these figures, the author remarked that he preferred giving the total quantity of gas unaccounted for, because he thought it was of greater value to know the actual loss than the percentage.

principals were carried on H-iron standards or verticals—the panels being filled in with 9-inch brickwork. In the next example, the roof was carried on the walls. It was a substantial building, with 18-inch piers, resting on a 2 ft. 3 in. plinth. The panels were of 14-inch brickwork; and the whole was tied together with a belting about half the height of the wall. It must therefore be considered as a substantially built wall; and no one seeing the plans would think of speaking of weakness in connection with it. Then, with regard to the question as to the saving of fuel, Mr. Jolliffe had mentioned the number of retorts in each setting. He might say that he had been using six retorts in the settings up to the present time, and also in the old house, where he used the open furnaces, they had settings of six; and so it was a fair comparison. He might say at once there was nothing uncommon in the setting; but what he wished to draw attention to was the construction of the furnace. He had explained the great difficulty he had in constructing the furnaces according to the designs supplied to him by the late Mr. Somerville. The furnace was almost identical in shape with that shown in the section. The principal difference lay in the fact that there were three air-flues and three gas-flues side by side between the side of the furnace and the side wall of the arch; while the design at present before the members had only one air-flue and two gas-flues. The furnace-bars were of 3-inch angle-iron, lying at an incline; and a supply of water was led into them so that the water trickled from front to back, cooling the bars and the coke immediately in contact with them, and tending to produce a soft clinker. He had experienced considerable difficulty in keeping the bars clear, so as to prevent the water running down them; and he had thought that he would do away with the water supply altogether, use the ordinary round furnace bars, and blow a jet of steam under the bars. He thought this would have the effect of dispersing the steam required through the fuel better than it would by passing cold water down the bars. One point Mr. Jolliffe made was as to the depth of the retorts. He (Mr. Child) must say he was guided in this matter by the experience of Mr. West, who was about to supply the machinery for drawing and charging. Mr. West had been a successful carbouizer; and he had designed his machines for that particular work. He (the speaker) did not think the rakes could be worked with a retort of much less depth from crown to floor. The coal was charged into the retorts so level that the rake supplied with the machines easily withdrew the coke; but if the retorts were made shallower, he did not think they could get a rake of sufficient strength and depth to properly draw the coke—especially if they were using Durham coal, and if the depth of the retort was reduced to 14 inches. He must say that this was a point upon which he should be guided by Mr. West; and he did not think he should have to regret his experience in this matter. Mr. Drage had made some remarks to the effect that the travel of heat being so far in Mr. Somerville's setting, he did not think it did its work efficiently. The travel of the heat was not more than in ordinary settings. It passed upward from the furnace, between the retorts, over the top retorts, then in a downward direction, and under the bottom of the retorts to the main flue. It was perhaps the length of the travel after leaving the retorts that was alluded to by Mr. Drage; but it was in this direction that true regeneration was obtained, and could only be accomplished by leading the waste gases through as long a flue as could be conveniently arranged in the setting. Mr. Best had spoken of high heats. Now, as far as high heats were consistent with every other portion of the work besides high yields, he (Mr. Child) also believed in them—in fact, if they could have them without stopped pipes, he did not think the heats could be too high for him. He had tried all sorts of things to prevent stopped pipes. He removed the pipes away from the brickwork; had screened them with plastic compound such as was used for boiler covering, and with iron plates standing in front of the benches; and he had put in pipes by means of which he introduced to the ascension-pipes a current of cold air. [Mr. BEST: Have you tried the water cure?] He had not tried the water cure; and he confined himself to such a heat as he found he could work with safely. He might also say that he had always supplied gas in Romford at a standard of 15 candles; so that he had to send it out of the works of at least 15½-candle power. He had done this without any admixture of cannel or any other means of enrichment. Therefore it did not do for him to take too much out of the coal.

Mr. H. WIMHURST followed with a paper entitled—

EXPERIENCE WITH THE PREPAYMENT METER SYSTEM.

I make no apology, as your Honorary Secretary, for reading this short paper, seeing that the members of this Association will not come forward with papers as readily as the Committee would wish at each of our general meetings. I have therefore consented to fill a gap by relating my experience with the prepayment meter system.

After giving the system serious consideration, I advised my Directors, in May, 1893, and they consented, to adopt prepayment meters in cottage property; but as a precautionary measure, I was to only order six as an experiment. These were fixed in June; and such was the demand, through an advertisement in the local papers and by circular, that during that month we fitted up 20 cottages with "coin" meters, fittings, and boiling-burners. These 20 meters proved such a grand advertisement for the system, that I was early inundated with orders, and was much delayed by being unable to procure the meters from the makers. However, as fast as we could get them, they were fixed, until at the end of 1893 we had fitted into cottages 144, to which number we have since added, and now have 203 prepayment consumers. This number could have been increased to 300 had we not ceased fixing during the past three months, owing to the pressure of other and more important business.

In deciding to adopt the system, I intended to be very careful as to the class of fittings we should use in fitting up the cottages; and I was determined to put in a good article that would not cost much for repairs. I therefore decided upon supplying two lights—one in each of two rooms—a swing pendant ¾ in. by ½ in., and a ½-inch single-joint bracket (both extra strong), fitted with a good 4-feet governor burner, also a good strong boiler-burner, 3 feet of best rubber tube, and a stopcock; each cottage being fitted throughout with compo. pipe, none less than ⅜ inch diameter being used. The average cost of each cottage, including everything but the service-pipe and main taps (which latter we provide free in all cases) was £2 15s. 6d., or, exclusive of the meters, 16s. 3d. per cottage.

So successful has gaseous fuel become with this class of consumers, that many of them have had fitted up a cottage cooker, for which a rent of 1s. per quarter is paid. As this cooker will not receive quite an equal treatment with those supplied to our larger and ordinary consumers, I have fixed the rent of them at a higher figure than usual, to cover the extra cost for repairs. We have supplied these cookers to about 17 per cent. of our prepayment consumers.

During the period from June, 1893, to June, 1894, these 203 meters have registered a consumption of 926,300 cubic feet, and have produced a revenue of £214 0s. 11d. This sum has been apportioned as follows: Gas, £174 2s. 5d.; meter-rental, £23 6s. 1d.; and fittings-rental, £16 12s. 5d. I may here say that our usual price is 3s. 9d per 1000 cubic feet, subject to discounts of 5, 7½, and 10 per cent. according to consumption. But, the prepayment consumer having to pay, in his pennies, the meter and fittings rental charges, I fixed this at 10d. per 1000 feet extra (not any too little, in my judgment)—making his price 4s. 7d. per 1000 feet, or slightly over 18 feet for a penny.

I should have preferred to give this paper at a future date, but for the promise of a meagre programme for to-day; hence the incomplete manner in which it is prepared. Had further time been at my command, I could have given—say, in twelve months' time—the exact average consumption by each consumer, and the profit made therefrom. But my experience leads me to say that we do get a very substantial sum from these, our latest friends—the "coin" meter consumers. When, however, you consider that these meters have been fixed spreading over a period of about eleven months, it is difficult to arrive at a perfect return. This, however, I do know, that, had we not adopted the system, we should not have had the supplying of over a million cubic feet of gas since its initiation, and the subsequent profit therefrom.

From a careful calculation, I find each consumer will use from 7000 to 8000 cubic feet of gas annually, which for every hundred will be (say) about 750,000 cubic feet, or for those we have now in use 1,525,000 feet. As I consider the extra 10d. per 1000 cubic feet we charge for this class of consumer covers the rental of meters and fittings, and also the extra cost of collection, if any, the profit will be that on the sale of a little over 1¼ millions; in my case equal to a sum of £115 or (say) £56 10s. for every hundred prepayment consumers. I find also each meter that has cost us £1 19s. 3d. will average 3s. 2d. per annum rent, or 8·07 per cent. of the cost; and the fittings in the cottages, at 16s. 3d. each, will produce a rental of 1s. 10d., or 11·28 per cent. of the cost. (Since writing the paper, we have made another bi-monthly collection from 200 prepayment meters, with the following result, which fully bears out my estimate of the total annual consumption from this source: The 200 meters have registered a consumption of 256,200 feet for the months of July and August, or an average of 1281 cubic feet per meter. If we multiply this by six, we get an annual consumption of 7686 cubic feet per consumer. The sum collected during the time stated was £57 17s. 3d., or £347 3s. 6d. per annum, if we take the past two months as an average for the year; but my opinion is that it is under, rather than over, the mark. However, I think we may assume this last collection to be a fair average one, seeing we have not fixed any additional prepayment meters during the period of July and August. This being so, we shall get an increased annual consumption of 1,537,200 cubic feet from this source alone.)

These figures are, in the writer's opinion, very satisfactory, especially for a small town depending entirely upon agriculture for support; and they are such as will induce him to further develop the system, until every house and cottage within the limits of supply has been fitted up with gas as a fuel and lighting agent. Bearing in mind that in the town of Sleaford only about one-half of the houses are at present supplied with gas, there is a good field before us. It speaks volumes for the prepayment system when I state that, of the whole number we have fitted up, not one has been returned; but, on the other hand, all who have adopted the system are loud in their praises of it; and the writer thinks that what prevails in one town can readily be adopted in others, and similar success be met with.

I do not pretend to say that the system has been adopted without much trouble, for such has not been the case. On the contrary, much labour has been expended upon it, especially in its earlier stages. But I am happy to say we have brought it into as nearly perfect working order as possible. A great deal of trouble has been caused by imperfect workmanship in the meters. The makers have been so pushed for them that no doubt the parts were fitted up in many cases in a hurried manner; but I believe they are now quite alive to the defect named, and exercise every possible care. Even then, at times, mistakes do occur. Another and more troublesome matter with us has been the very free use of damaged and misshapen pennies that have been inserted in several cases—blocking the coin cylinder, and tending to damage the coin attachment. I think it may be an opportune time for all users of automatic machines to petition the authorities to call in all defaced bronze coins. If this can be done, much of the trouble with prepayment meters will disappear.

There is one matter I wish to mention in this paper, and that is the action of the makers of prepayment meters in reducing the period of guarantee from five years to one year. This, to my mind—and many others agree with me—is wrong, not only in principle, but against their own interest. The makers have succeeded in inducing gas companies and corporations to take up the system and get it into working order at no small cost, on the understanding that these meters would be guaranteed for the usual period; and when they find several meters come back to them for repairs, through no fault of the gas company or of the consumer, but on account of imperfect workmanship in the meters, the makers turn round and say: "We have not guaranteed these meters at all, and we shall only do it for one year." To say the least, this is sharp practice, and such as should be resisted. My experience leads me to say that the makers can readily give the usual five years' guarantee. The firms of whom we have bought know well that I have not returned more than 5 per cent. of the prepayment meters supplied to my Company. I am aware that during the last few weeks, since I have taken up this matter rather publicly, the makers have decided upon giving the usual guarantee for an extra payment of 2½ per cent. for the other four years. Their argument is that, at present prices, it will not pay, and that they have been losing money upon these meters from the commencement. My opinion is that the meter makers are quite capable of taking care of themselves; and when they fixed the original prices of the "coin" meters, I have no doubt they left a very fair margin of profit. At any rate, no gas engineer would wish to buy of them any article upon which they had not made any other than a fair profit; and my advice to the makers is this: Revise your prices, and give the usual guarantee of five years with every meter. I may here add the meters do not receive that rough treatment which the makers would lead one to believe.

In conclusion, let me thank you gentlemen, for your forbearance in listening to this rather meagre paper. I trust it may lead to some debate; and then I shall be amply repaid for the little trouble I have taken (perhaps unwisely) in preparing this subject for discussion. I should like, as your Secretary, to add a request that each member may, in his turn, prepare a paper upon some useful subject for discussion; and thus lighten somewhat the most irksome part of a secretary's duty—asking gentlemen time after time to prepare and submit papers for discussion at our meetings.

Discussion.

The PRESIDENT remarked that the paper was a very interesting one. He could not himself say much about prepayment meters yet, as he had only recently commenced to introduce them; but he believed there were gentlemen present who had met with equal success to Mr. Wimhurst.

Mr. JOLLIFFE said he desired to congratulate Mr. Wimhurst upon having found time, among his other multifarious duties as Secretary of the Association, to favour the members with this paper. What he had to say upon the subject was more in the character of a supplement to, rather than a criticism of, the paper. At Ipswich they had gone in very largely for prepayment meters, and, he thought, with a great measure of success. They had nearly 1000 of them fixed; but he was "on strike" just now against the meter makers for what he regarded as their very shabby behaviour. Mr. Wimhurst had given them his figures in regard to the cost of fitting up the houses, and also the average consumption of gas. He had not, however, been able to give an actual twelvemonth's experience; but he (Mr. Jolliffe) was in a position to do so up to the end of July for a small portion of their consumers. He might perhaps mention that, in fitting up the houses, they went to work in rather a liberal way. They did not confine themselves to two burners; nor did he think it wise to do so, because, if people found the burners in the rooms, they would use them, but if they only had them in two of the rooms, they would still have the horrid paraffin lamp at their sides, and wherever they went about the house they would carry it with them. The cost of fitting up the houses had been, *minus* the gas-ovens, on the average £3 3s.—that was, £2 for the meter, 18s. 2d. for the fittings, and 4s. 7d. for labour. This, however, did not quite cover the total cost of fitting up the houses if they were starting *de novo*. Some of the houses had pipes in them already; and this was why the average had been reduced to £3 3s. It would probably cost for a new house something like £3 17s. The average revenue over the twelve months had been £2 2s. 6d.; and the average consumption, 12,700 cubic feet. The price of the gas was 2s. 10d. per 1000 cubic feet; and they charged an additional 6d. for the slot meter arrangement. It was not enough; but, having started with the 6d., they had adhered to it. The average interest upon the outlay had been 10·6 per cent. Coming to the houses that they had fitted up with stoves, the members would be surprised to hear, as he was to find, that the results to the Company were not so profitable. Although there was an increase in the quantity of gas sold per consumer, yet the cost was so enhanced—that was, the oven so increased the average cost—that the percentage to the Company only ran up to about 8·5. The meters cost £2; and the fittings ran up to £1 3s. 1d. The fittings included the pipe to the gas-stove, and also the cost of carting the stove about. The ovens they had adopted at Ipswich were perhaps not generally used; but, as with the fitting up of the houses, so with the fitting up of the ovens, they had done it very liberally. He was strongly of opinion that a working man, if he used a gas-oven for convenience, must have one sufficiently large to do all the work that was required to be done in an artizan's house, where there was sometimes rather a large family. The cost of the oven was £2 15s. gross; and £1 16s. 8d. net. In the earlier part of the summer, they put in a rather more expensive oven, the average cost of which so far as they had gone was £2 12s. 10d.; and the labour of fitting up the house and fixing the oven was 7s. 8d. This brought them up to a grand total of £6 4s., which was very nearly double the average cost of fitting up the houses without the oven. The average revenue had been £3 6s. 9d. per annum; and the consumption, 20,000 cubic feet. Of course, they had calculated the amount of profit that should be apportioned to the gas; and then on the outlay they obtained 8·5 per cent., which was rather less than in the fitting up of the houses with burners alone. He was not, however, going to cease putting in gas-ovens because he did not get quite so much interest as he anticipated, as he hoped that the cost of fitting up would yet be materially reduced. Their experience had been decidedly favourable to this system; and he should be very sorry indeed to give it up. Now, as regards the action of the meter makers, he felt very strongly that they had behaved very shabbily to the gas companies. They introduced these meters, and added 17s. or 18s. to the net cost of the meter for the attachment. This 17s. or 18s. was calculated fairly and fully to give them a profit as they started on the business. Now, to his mind, it was pretty clear that, as they went on manufacturing these attachments, the cost must be necessarily reduced. He could not see why, after having issued these meters for twelve months, and after having had an extraordinary amount of business that they would not have had (because the consumption of gas had been diminishing through the country, and the need for new meters did not exist) had it not been for the slot meters being introduced, he thought the treatment on the part of the makers was unfair. His Company had spent over £4000 upon prepayment meters and fittings; and it was shabby in the highest degree for the makers to say they would now only guarantee the meters for one year; and he was of opinion that it ought to be resisted. Why he thought so was because the meter was their life. If there was any imperfect workmanship in the meter, they were put to a manifest disadvantage; and it was only by a guarantee of the sort they had hitherto had, that they could depend upon the perfect workmanship that was demanded by the meter. To ask them, after they had introduced so many of these meters, to agree to this one year's guarantee, was asking them to do what they had no right to do; and therefore he hoped that his professional brethren would resist this innovation on the part of the meter makers, and see whether it was not possible to get it altered. He had written to 50 or 60 of his brethren; and he had had replies which concurred entirely with the views he had endeavoured now to express. He hoped that, before the meeting closed, those present at all events would show that they felt the action of the meter makers was, to say the least, very shabby.

Mr. J. WHIMSTER (Armagh), having been invited by the President to speak, said he did not anticipate being called upon to take part in the meeting, at which he was very pleased indeed to be present. He supposed, however, he had been called upon to say something in respect to the subject under discussion, seeing that he was the Secretary of the North of Ireland Gas Association, at whose recent meeting they took up the question of the guarantee for prepayment meters. Having received a circular from Mr. Wimhurst calling their attention to the reduction of the guarantee for coin meters, the matter was considered by the Committee; and they decided to take the sense of the members upon it at the annual meeting. It was freely discussed by them; and they seemed to think, as the result, that the one year's guarantee was rather "hard lines," and their impression was that it would militate against the meter makers' interests by inducing managers to buy from hand to mouth. In the case of a small town, if they stocked ten or twelve meters, the guarantee might run out before the manager had any opportunity of testing them. The North of Ireland Association therefore unanimously resolved to inform the meter makers that they did not want the meters cheaper than they could afford to sell them at. But they did want a five years guarantee; and, if the prices required revision, then they were

quite willing to accept a revised list. Of course, if the prices did not want revision, then the meter makers would have to make that right among themselves, because, if one of the makers could sell the meters at a cheaper rate than the revised prices, he would be sure to do so. The Irish Association passed a resolution that they would ask the meter makers to do this, and give them five years' guarantee; and it struck him that if the Eastern Counties and some of the other Associations were to pass a similar resolution, they might perhaps combine, and embody the resolutions in one circular, in the name of the different District Associations, and send it round to all the meter makers, expressing their views against the reduction of the guarantee, and asking them to put the automatic meter on the same footing as other meters. Something of this sort would show that they were unanimous in the matter, and really in earnest; and then, if meter makers chose to leave the matter where it was, gas managers must merely buy their meters from hand to mouth.

Mr. JOLLIFFE asked to be allowed to briefly supplement his previous remarks. The meter makers, he said, had now sent out a list with five years' guarantee; but the prices were so prohibitive that he did not think gas managers could accept them. They asked not for 10 per cent. increase upon the meter attachment, but 10 per cent. upon the total cost of the meter, which to his mind was unreasonable and prohibitive.

Mr. CHILD said he had had little experience with automatic meters. This had not been from any want of desire on his part; but simply because the meters were not easily procurable. There was such an enormous demand for these meters that every maker thought he was bound to offer one to the public, whether or not it was a well-considered design. He offered it to purchasers at all events; and they might obtain a sample, and that was about the utmost they could get. Well the various samples he had had in use had really proved not so much the want of good workmanship as the want of good design; and in that case he quite agreed with Mr. Wimhurst and Mr. Jolliffe as to the maintenance of the principle that there should be a five years' guarantee. He believed the meters would be worn out in three months, or at all events a consumer would only want three months to find out that the meters were unreliable. If one of the makers could complete a thoroughly trustworthy design, there would be a good demand for it; but from his experience, such a meter had yet to come. The greatest advance he had seen was in two meters, in which the valve had been completely altered, and had taken the form of a cylindrical valve hanging on a loose spindle, and pressing into a seating accurately fitting it. With the meters he had hitherto tried, he had found that the coin was short for the amount of gas registered. But the valve which had been brought to his notice was of a form that would be successful, because the greater the tendency of the meter to continue working after the amount of gas had passed for 1d, really shut the valve more firmly in its seating, and cut off the supply of gas. The meter makers, it appeared to him, had started before they were ready; and they should not blame the purchasers in their present contention, because many of the makers were making the introduction of the prepayment meter simply a form of advertisement for their other meters.

Mr. J. BARTON (Peterborough) thought that the prepayment system would be an important one in the future; and no doubt would be a source of considerable revenue to gas companies. He, however, quite agreed with Mr. Child that the perfect meter had yet to be produced; he had not seen one up to the present that answered the purpose satisfactorily. With regard to the guarantee, he failed to see why the meter makers should reduce it to one year, because, if the gas companies or their consumers damaged the meters, he took it that the companies would be willing to pay for the repairing; and, on the other hand, he thought the meter makers ought to have sufficient confidence in their arrangement to put it right if it failed. He quite agreed with Mr. Jolliffe that it was a great hardship on a gas company that, after having had the trouble of introducing these meters to consumers, they should take all the responsibility, and the meter makers go free. His experience was that in a few months the attachment failed through no fault of the company or of the consumer; and were they therefore to be answerable for the expense of putting it right? He thought it would be well for the meter makers to reconsider the matter, and to fall in with the views of the gas companies.

Mr. DRAGE said he had only had the prepayment system in use about fifteen or sixteen weeks; and in clearing the meters a short time since, he was particularly struck in one instance where the consumer had previously given up the use of gas, but had again become a consumer when the slot meters were introduced. This consumer had used the slot meter ten weeks, and the amount he had paid for gas was £1 3s.; whereas he had formerly given up using gas because his account came to £1.

Mr. MITCHELL said he was not in the position of the other members who had been able to discuss this matter of prepayment meters, because he had not yet had any experience with them. Mr. Wimhurst had been able to show that with him this system was a matter of profit. Of course, the occupiers of property of different kinds differed in the amount of gas they would be in a position to use. The well-paid artizan would be able to use a quantity of gas that would make it pay to supply him; but a smaller consumer would not perhaps use a quantity that would pay. He thought, however, that Mr. Wimhurst had shown that, in an average country town, he had been able to succeed; so that he had no criticism to offer on the paper, which spoke for itself. There was only one matter he should like to allude to; and it had reference to the meter makers' guarantee. It was rather unfortunate that they only heard one side of the matter, as every question of this kind had two sides to it. But no doubt the meters makers would find an opportunity in another way of putting the matter before them from their point of view. As Mr. Child had pointed out, this was entirely a new thing; and they could hardly rush to the conclusion that, in fixing their prices for the prepayment meter, the makers expected that the arrangement would go wrong in twelve months, and that they took into account the expense of repairing and putting it right. It was just possible they did not take this into consideration. The makers had not had experience with the meter any more than had the consumer. The same argument applied on the score of the profit which gas companies had made through the meters. By their own confession, the system had been a good thing for them; and, therefore, they could hardly expect that the meter makers would take all the blame and loss that might be caused by the fault of the attachment. As to the prices that the makers put upon the meters, he had no knowledge as to whether or not they were justified; but he did think the gas companies should be very careful before they threw on them the onus of all the trouble that had taken place. The makers were only just gaining experience of what their meters could do, just as the gas companies were getting experience of what they could not do.

Mr. WIMHURST said he was much obliged to the members for the way in which they had received his paper. He congratulated Mr. Jolliffe on the success he had met with in adopting the prepayment system. He had stated that his average consumption of gas was 12,700 cubic feet; and he (Mr. Wimhurst) thought this figure exceeded the average of the South Metropolitan Gas Company, which he believed was about 12,000 cubic feet. Perhaps this arose from the quality of the gas, because if they supplied a gas of 14 or 15 candle power, the consumer would require more than if it was of 17 or 18 candle power. There was one other matter as to the guarantee. He believed some of the meter makers were present; and they might take it as the feeling of the meeting that the gas managers in the Eastern Counties at any rate wished the makers to give the usual guarantee of five years, whether or not they revised their prices, and that they were quite willing to pay them a proper price. He had recently given out a small order for twelve meters, with a guarantee of five years; but he had had to submit to the addition of 2½ per cent. for four years. He hoped that, before he had occasion to give out another order, they would withdraw the one year's guarantee. He quite agreed with Mr. Jolliffe that they had behaved very unfairly charging 10 per cent. on the whole cost of the meter. If they had charged 10 per cent. on about 15s., he should not grumble; but putting 10 per cent. on £2, was "too much of a good thing."

A hearty vote of thanks was passed to Messrs. Child and Wimhurst for their contributions to the proceedings.

ELECTION OF OFFICE-BEARERS.

Mr. JOLLIFFE moved the election of Mr. C. W. Grimwood as President for the ensuing year. They had all known that gentleman since the inauguration of the Association; and they knew his kindly and courteous disposition, and felt sure that he would make an admirable President.

Mr. BUCKLE seconded the motion, which was adopted.

Mr. GRIMWOOD thanked the members for this mark of their esteem and confidence, and assured them that he should endeavour to maintain the prestige of the Association during the twelve months he should have the honour of presiding over it.

On the proposition of Mr. W. J. WELLS (Stamford), seconded by Mr. C. ELLIS (Yarmouth), Mr. Drage was elected to the vice-presidency.

Mr. C. PANCHEN (Yarmouth) proposed the re-election of Mr. Wimhurst to the office of Secretary and Treasurer.

Mr. BARTON seconded the proposition; and it was cordially agreed to.

Mr. WIMHURST, in acknowledging the continued confidence of the members, observed that, if he remained in his present office another twelvemonth, he should have served the Association for seven years; and as his duties at home and on the works had been greatly increasing of late, he should then have to ask the members to find some other gentleman to relieve him of the position.

Messrs. Jolliffe and Child were elected to serve as members of the Committee for two years; and Messrs. Ellis and Panchen were appointed Auditors for the same period.

THE SPRING MEETING.

On the invitation of the PRESIDENT-ELECT, it was decided to hold the next meeting at Sudbury.

VOTE OF THANKS.

Mr. MITCHELL moved that a vote of thanks be given to the President, Vice-President, and officers for their services during the past year. He thought he might say without exaggeration that this had been one of the most successful years the Association had had; and this had been due in no small measure to the fact that Mr. Carpenter had been their President.

Mr. CHILD, in seconding the motion, expressed his regret at hearing of Mr. Wimhurst's intention to resign the post which he had so ably filled.

The motion was carried.

The PRESIDENT, on behalf of himself and colleagues, thanked the members for their vote; and, in the course of his remarks, he acknowledged the kind assistance that he had received from Mr. Wimhurst during the year.

This concluded the business of the meeting.

About six o'clock, the members reassembled for dinner. A few toasts were afterwards honoured; and the speeches were interspersed with some well-rendered songs and recitations by local gentlemen.

WATER GAS IN AMERICA.

In a recent number of the *Journal of the Society of Chemical Industry*, there was an abstract translation of an article by Mr. F. BREDEL in the *Zeitschrift für Angewandte Chemie* on the above subject. Commenting on some observations made by Herr Lunge, in a previous issue of the latter publication, to the effect that the supply of gas coal is failing in the United States to such an extent that ere long it will be necessary to import this kind of coal from England, the author remarks that, on the contrary, the United States is the richest of any country, both as regards the quantity and the quality of such coal. The following are the more important of the coal-fields: Pennsylvania, whence the best gas coal—viz., the Youghiogheny—is obtained; and West Virginia, where the gas coal contains more sulphur than the other. The coal of the Indian territory is a relatively good gas coal, and is much used in Texas. The Colorado coal-field yields a very good gas coal; while the coal of the State of Washington is also considerable in quantity, and good in quality as a gas coal. With the best Youghiogheny gas coal, a yield of from 5 to 5·15 cubic feet of gas per pound of coal is afforded. The illuminating power of this gas is 18 to 20 candles (London standard). The author then goes into details respecting the gas and coke production of the various kinds of American coal. Coal gas, he says, is cheaper than water gas when both are calculated to candle power. The only advantage that water gas possesses over coal gas is that the former has an illuminating power of 23 to 28 candles per 5 cubic feet, whereas the highest limit that can be obtained with the latter is 20-candle power. Many manufacturers enrich their coal gas with naphtha gas, which is made in the same way as Pintsch's gas. In many States a mixture of two-thirds coal gas and one-third water-gas is supplied. This gives a very beautiful light, equal to 22-candle power. The following table shows the price and quality of the gas supplied in various parts of the United States:—

Name of City.	Price per 1000 Cub. Ft.	Illuminating Power in English Candles.	Kind of Gas.
	Dols.		
New York	1·25	22	Mixed gas.
Philadelphia	1·00	22	"
Cleveland	0·80	18·75	Coal gas.
Wheeling, West Virginia	0·75	18	"
Chicago	1·20* / 1·00†	23	Water gas.
Milwaukee	1·00* / 0·80†	24	Water gas (⅓). Coal gas (⅔).
Baltimore	1·25	28	Water gas.
St. Louis	1·18	20	Mixed gas.

* For lighting. † For heating and motive power.

The author, in conclusion, states that, contrary to Herr Lunge's assertion, purification of gas by means of oxide of iron is more general than by lime. The latter is, he says, used in but very few works, and then only for the purpose of removing the carbonic anhydride from water gas.

The Cost of Gas Power for Electric Lighting.—According to an article by M. Witz, in *L'Industrie Electrique*, the annual cost of 150,000 lamp-hours, with 15-candle lamps, and gas at 15c. per cubic metre (3s. 4d. per 1000 cubic feet), is 0·53d. per hectowatt-hour; for 450,000 hours, 0·418d.; and for 1,500,000 hours, 0·352d. In these figures, provision is made for interest and redemption at 15 per cent.

The Manufacture of Briquettes in Belgium.—In the course of the paper read by M. Briart, before the Iron and Steel Institute, on "The Mining History of Belgium," to which reference was made last week, he alluded to the manufacture of briquettes, which he stated was installed in the district of Charleroi about fifty years ago. He remarked that not only had the industry grown largely in Belgium, but the need for converting part of the small coal into a more useful form had begun to appear even in more favoured coal-fields.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Fair Play for Gas after it Leaves the Consumers' Meters.

SIR,—The designers and makers of electric light fittings are, to say the least, quite equal to the gas people in designing fittings, &c., of really artistic merit. This point is scarcely grasped sufficiently by those interested in gas. We forget that the only things the general public know about gas are the actual light, and the burners and fittings in their rooms and in the streets. Fine works and ingenious appliances for manufacturing, purifying, and distributing gas, they know nothing about, as this does not come under their notice; and hence it behoves the gas fraternity to see that gas is presented to them in at least as attractive a form as electricity is. There are but few firms making gas burners and fittings; and they are little known by the general public. These firms are, therefore, in danger of folding their hands and comforting themselves with their individual prosperity, while the multitude of electric light people are trying to rival one another in the excellence of design and display.

Something is needed to stir up the gas people to take more interest in the gas after it passes the consumers' meters. If the various gas engineers' institutions would but devote a portion of their energies (by appointing special committees or otherwise) to the encouragement of artistic design in gas-fittings, and to the proper presentation of gas to the consumers, it could not fail to be beneficial. As things are now, they practically concentrate their attention on gas as far as the meters, after which it is left to take care of itself. Unfortunately, it is only where the gas supplier parts company with the gas that the consumer begins to take an interest in it. The general public judge entirely of gas after it passes their meters; and it is what takes place after the meters that the gas fraternity ignore, although it is by the after treatment alone that it stands or falls in the estimation of the public.

F. S. CRIPPS.

27, Great George Street, Westminster, S.W.,
Aug. 25, 1894.

MISCELLANEOUS NEWS.

THE GAS AND WATER ORDERS OF THE PAST SESSION.

The Board of Trade have just issued a report on their proceedings under the Gas and Water Works Facilities Act, 1870, during the past session. It states as follows:—

In December, 1893, 15 applications for Provisional Orders under the Gas and Water Works Facilities Act, 1870, were made to the Board of Trade—nine relating to gas, and six to water undertakings. Power was sought in these Orders to raise £264,500 by shares and £80,000 by loan, of which £142,500 share and £50,000 loan capital related to gas undertakings, and £122,000 share and £30,000 loan capital to water undertakings.

The following is a list of the applications relating to gas: Bolsover, Broadstairs, Earby and Thornton, Ilford, Newquay (Cornwall), North Bierley, Uttoxeter, Willenhall, and Worthing.

Four applications for Gas Orders were in respect of undertakings already existing without parliamentary authority; and they sought for such authority to maintain and continue the existing works, and to continue the manufacture and supply of gas—viz., Bolsover, Earby and Thornton, Newquay, and Uttoxeter. The Bolsover application included power to construct additional works.

The Broadstairs, Ilford, North Bierley, Willenhall, and Worthing applications related to undertakings already authorized by Parliament. The Broadstairs application was for power to construct additional works for the storeage of gas and coke; those relating to Ilford and Worthing, for power to construct and maintain additional works, and to raise further capital; the North Bierley application, for power to extend the borrowing powers of the Company; and that from Willenhall, for power to raise additional capital. Objections were lodged against some of the applications; but, with certain modifications and amendments, the Board decided to grant all of them except that relating to Broadstairs.

Numerous objections were lodged in regard to Broadstairs; and the Board directed Major Marindin, R.E., C.M.G., one of their inspecting officers, to hold a local inquiry upon the application. Major Marindin reported that it was essential for the Company to provide additional storeage accommodation with as little delay as possible, and that the proposed site was not an unsuitable one. While, however, he held that the objections generally could not be maintained, he was of opinion that, in certain cases, the property of objectors would be seriously affected by the granting of the Order; and as the Company had failed to show that the site proposed was the only suitable one obtainable, he considered that those objections should not be overruled. The Board accordingly informed the promoters that they would not proceed with the Order so long as the objections remained. The promoters failed to effect an agreement with the objectors; and the application was therefore not proceeded with.

The Board also directed Major Marindin to hold a local inquiry with regard to the Newquay application. He reported that it was desirable, in the interests of the consumers, that the Company should be able to obtain statutory powers; and that he did not consider that the objections were of sufficient weight to justify the refusal of the application. He therefore recommended that, subject to certain modifications, it should be granted. The Board consented, and amended the Company's proposals in various respects.

In the case of the Ilford application, Major Marindin was instructed to visit the site of the proposed enlargement of the works; and the various objectors were invited to meet him in support of their objections. He reported that the site was a suitable one, and that none of the objectors would be injured by the erection of the proposed works. The Board accordingly granted the Order, with certain modifications of detail.

The sliding-scale of price and dividend was adopted in the following Orders; the initial price per 1000 cubic feet being fixed as follows: Bolsover, 5s. 3d.; Ilford, 4s. 6d.; Uttoxeter, 3s. 2d.; Worthing, 4s. 3d. —the dividend not to be increased above the standard rates of dividend, unless the price charged is 1d. or more below 3s. 9d. per 1000 cubic feet. In three Orders, a maximum price per 1000 cubic feet was fixed as follows: Earby and Thornton, 5s.; Newquay, 6s.; and North Bierley, 4s. Power was reserved to the Board to vary the maximum price, or to substitute a sliding-scale—after five years in the Newquay Order, and after three years in the other Orders.

The supply of gas in bulk beyond the district, subject to the usual limitations, was authorized in the Bolsover, Ilford, Newquay, Uttoxeter, and Worthing Orders. The Orders contain the usual clauses as to the sale of additional capital by auction or tender, limits of dividend, the creation of insurance and reserve funds, illuminating power, testing of gas, quantity of land to be taken by agreement, &c. Where necessary the Gas-Works Clauses Acts, 1847 and 1871, were incorporated.

Two Bills to confirm the Orders were submitted to Parliament—both being introduced into the House of Lords on May 1. A petition was lodged against the Ilford Order in No. 1 Bill, but was subsequently withdrawn. The Bills received the Royal Assent on the 20th of July.

The applications for Water Provisional Orders were as follows: Bishop's Waltham; Blandford; East Surrey; Steyning; Tilehurst, Pangbourne, and district; and West Cheshire.

In the Blandford and Tilehurst applications, authority was sought to establish new water-works; the Steyning application was to authorize the undertakers to supply that town with water derived from the Shoreham and District Water-Works Company; the Bishop's Waltham application was for power to maintain and continue existing works and to supply water; the East Surrey, to authorize the acquisition of further land and the raising of additional capital; and the West Cheshire, for an extension of limits. The Board granted a Provisional Order, with such amendments as were considered desirable, in each case except Steyning.

With regard to the Steyning application, the Board desired to be satisfied that the Shoreham Company could furnish the requisite supply of water without detriment to the consumers in their own district. Major Marindin was accordingly appointed to hold a local inquiry. He reported that it would be to the advantage of the parish of Steyning to obtain the water in the manner proposed; and that the supply to the Shoreham Company's consumers would not be in the slightest degree affected. The Board thereupon held a conference with the parties interested, and settled the terms of an Order. The Steyning Union Rural Sanitary Authority strongly objected, however, to the Shoreham Company being authorized to supply water to the undertakers of the Steyning Order, unless an inquiry was held into the existing supply of that Company in their own district. It was alleged that improvement in such supply was much more important than the proposed supply to Steyning, which was already well provided with water for domestic purposes. This protest was joined in by the New Shoreham Local Board; and on the 5th of April, the Board of Trade informed the parties that the Order would not be proceeded with. On the 18th of April, a letter was received from the Steyning Authority withdrawing their opposition; but by this time it was too late to comply with the requirements of the Gas and Water Works Facilities Act, 1870, and the Order could not, therefore, be granted.

A Bill to confirm the Water Orders was introduced in the House of Lords on the 1st of May. It passed through both Houses without opposition, and received the Royal Assent on the 20th of July.

Following the report is a table showing the number of Orders made by the Board of Trade since the passing of the Gas and Water Works Facilities Act in 1870. In the 24 years which have since elapsed, 418 Orders have been applied for, and 391 made by the Board of Trade, of which 385 have been confirmed by Parliament. The total amount of fees received with the applications has been £29,295.

BELFAST CORPORATION GAS SUPPLY.

Annual Accounts—The Extension of the Water-Gas Plant.

At the Monthly Meeting of the Belfast City Council last Saturday week—the LORD MAYOR (Mr. W. M'Cammand, J.P.) presiding—the Gas Committee submitted a report dealing with the accounts for the year ending June 30, and recommending that they be authorized to repair the old benches of retorts in No. 1 retort-house with the buildings and appliances necessary for the production of water gas as occasion may arise, in accordance with the report of their Engineer (Mr. J. Stelfox), which was appended, and which appeared in last week's issue of the JOURNAL. Regarding the accounts, the Committee stated that they showed a profit on the year's working of £28,484, adding to which the balance from last year (£2399) made a total of £30,883. Deducting the contribution to loans fund for the repayment of debt (£4176) left £26,707. This sum the Committee proposed to deal with as follows: To write off as depreciation in value of meters, lamps, and stoves, £6852; to carry to credit of insurance of works account, £2000; and to the credit of capital account, £15,000—making a total of £23,852, and leaving a balance of £2855 to be carried forward. The Committee did not anticipate that the year's working would have been so profitable, owing to the very great expenditure rendered necessary by the coal strike. They were, however, able to cancel some contracts for coal at high prices; and the use of the water-gas plant (which has been very successful) had contributed to bring about this satisfactory result. There was an increase of 606 in the number of consumers during the year; the total number on June 30 amounting to 24,994. The quantity of gas sent out during the twelve months was 1112 million cubic feet, which was a decrease, as compared with the previous year, of about 29 millions. A similar decrease, the Committee observed, had been experienced in almost every gas undertaking in the United Kingdom, mainly due to the very mild and open character of last winter. This cause was supplemented in their own case by the loss of output occasioned by the necessity of reducing the pressure considerably during the period when coal supplies were almost exhausted. Under these circumstances, the Committee considered the results already referred to as specially gratifying.

Mr. YOUNG, in moving the adoption of the report, drew the attention of the Council to the fact that, notwithstanding the high price of coal during last year, the profits up to June 30 amounted to £28,484; and when they added to this the balance of £2399 from the previous year, they had a gross total of £30,883. The report also mentioned that they had been able to cancel an order for coal; and as, when this order was given, coal was at a very high price, a considerable sum of money had been saved. As to the statement by the Engineer with reference to water gas, he said that Mr. Stelfox had been requested to report to the Committee regarding the extension of the gas-works; and whether they should take a portion of the park or ground outside, was a matter which had been very much discussed by the Corporation. Since that discussion took place, a great development had been witnessed in the manufacture of water gas; and, in consequence of this, they would not require to extend the works as originally contemplated, and the supply of gas from the new process would be about six or seven times as much as that from the old. Mr. Stelfox's recommendation was to the effect that the Committee should be authorized, instead of renewing the old retort-house in the way they had hitherto done, to utilize it for the manufacture of water gas; and he had given an estimate of the cost of the proposed change. If this proposal were carried out, the erection of a new gasholder at a cost of from £70,000 to £80,000 might be deferred for some years. He (Mr. Young) thought that the ratepayers should be very well satisfied with the work of the Committee; and he trusted the Corporation would unanimously, as did the Committee, decide to strengthen the hands of Mr. Stelfox in the matter.

Mr. W. M'CORMICK seconded the motion.

Mr. HARRISON said that so far as the profits were concerned, the report was satisfactory; but he wished to point out that, as the large consumers obtained their gas at practically cost price, the profit of £28,000 must be obtained by charging the poorer class and the small consumers a good deal more than cost price. He thought that the time had come when something ought to be done to relieve the small consumers of part of this great burden. They were not a trading community; they did not keep the gas-works merely for the purpose of making profits, or for taxing the smaller consumers, and giving the large consumers special advantages. In connection with the proposed extension, he would like to ask should they incur this vast additional expenditure when they had introduced the electric light into the city? They should at least have some information as to how far the gas would be eased, as it were, by the increase in the electric light.

Alderman GRAHAM said that it seemed to him this matter was being rushed through very quickly. He understood that where 15 stokers were formerly employed, one would be sufficient now by the water-gas process; and they could all understand the effect this would have upon the wage-earning population. He did not see the necessity for making the proposed change this year, and especially as they had introduced the electric light. He would also like to know whether there would be any coke for sale, as the delivery of coke had been the means of keeping hundreds of poor hard-working families out of the workhouse. He was of opinion that the whole question should be considered by the Council in committee; and with that object in view, he moved, as an amendment, that the report be referred back to the Committee—omitting the portion with reference to the extension of the water-gas system.

Mr. W. M'C. WILSON seconded the amendment.

Mr. J. M'CORMICK admitted that the report was a very satisfactory one, when they considered the question of profits; but he held that it was an indefensible principle that the large consumers should be supplied with gas at cost price, while private consumers paid the price they did. The same principle was about to be put in force in connection with the sale of the electric light; and he thought it was time this matter should be taken into consideration, and that the small consumers should no longer be placed at this disadvantage. When discussing the question, he thought they should not lose sight of the fact that the ratepayers had been saved an enormous expenditure in connection with the proposed extension of the gas-works. Alluding to the observations of Alderman Graham, he pointed out that, if the number of men employed at the gas-works would be reduced by the extension of the water-gas system, many of them would be employed at the electric light works. In the interest of the ratepayers, they should heartily approve of the introduction of the water gas.

Mr. YOUNG pointed out that neither the Gas Committee nor the Corporation had any control over the abatements made to large consumers, as this was done under statute. Their price would favourably compare with the charges anywhere else in the kingdom. With regard to the stokers, it was unfortunate that the labour would be much less at the gas-works; but, as had been pointed out, the men would get employment at the electric light works. The Committee were trustees for the ratepayers; and they could not employ men for whom they had no necessity.

The amendment was then put to the vote, and negatived by 4 votes to 23. The report was consequently adopted.

Carlow Water Supply.—Last Wednesday, the Chairman of the Carlow Town Commissioners (Mr. M. Goverrney) laid the foundation stone of the new reservoir which is to be constructed at Killeshin for the supply of the town. The work has been planned by the Consulting Engineer to the Commissioners (Mr. W. G. Strype); the Executive Engineer being Mr. H. V. White.

Improvements at the Bolton Water-Works.—The Bolton Corporation, having obtained sanction for the borrowing of £34,464 for water-works purposes, are now negotiating for a loan to this amount. A sum of £3500 is required for connecting the springs and Dingle reservoirs at Belmont, so as to improve the storeage capacity there; and close upon £8000 will be expended in improving the gathering-ground at Heaton and Entwistle. A new lattice bridge at the Sweetloves reservoir will absorb £3000; and the balance of the £34,464 is required for new mains.

THE FINANCES OF THE MANCHESTER CORPORATION GAS, ELECTRIC LIGHTING, AND WATER DEPARTMENTS.

Auditors' Report.

We have already given in the current volume of the JOURNAL full details of the accounts of the Manchester Corporation Gas and Electric Lighting Departments for the year ending March 31 last (see pp. 40, 153); and the recent issue of the annual statement of the Corporation accounts now gives us the opportunity of quoting the portions of the report of the Auditors (Messrs. Ashworth, Mosley, and Co.) which present, in concise form, the financial position of those departments and of the water-works, at the date named.

Concerning the gas-works, the Auditors say: The net revenue for the year ended March 31 last amounted to £30,589, as compared with £64,792 in the preceding year; thus showing a net decrease of £34,203. The amount paid over to the city fund in aid of rates was £64,321; the balance of £33,731 being withdrawn from the contingent fund, which is in consequence reduced to £5880. The increased cost of coal, consequent upon the coal strike in the autumn of 1893, more than accounts for this decreased net revenue. There was also a falling off in revenue from gas and stove and meter rents amounting to nearly £11,000. Against these two items of increased cost of coal and diminished revenue from gas-rents should, however, be placed the increased amount received for residual products—viz., upwards of £22,000. The contribution to the sinking fund in this department in the past year has been £13,954, as in the previous year. The sum of £21,634 has been charged against the past year's working in respect of renewals of plant, &c.

Regarding the Electric Lighting Department, the report states: The expenditure on capital account in the past year has amounted to £86,264; and the total indebtedness of the Corporation for loans now amounts to £127,830. After setting aside £1376 for liquidation of debt, and providing £610 for interest during construction, the year's working shows a deficit of £209.

As to the Water Department, the Auditors remark: The net revenue for the year, after setting aside for sinking funds £30,830, amounted to £22,453, as compared with a deficiency in the previous year of £8711; making a difference in the two years of £31,164. The reduction in the amount of contribution to the sinking fund represents £17,966 of this increased revenue. The amount of surplus revenue at March 31, 1894, was £23,310. There has also been an increase in the revenue for water, as compared with the year to March 31, 1893, of £5036, equivalent to 2·1 per cent.; and there has been a large decrease in the expenditure under the head of maintenance. The net expenditure during the year on capital account has been as follows: At Longdendale, &c., £14,684; at Thirlmere, £137,574; and hydraulic power, £47,693—a total of £199,951.

HARROW DISTRICT GAS COMPANY.

The Company's New Act.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Guildhall Tavern, Gresham Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY and ENGINEER (Mr. J. L. Chapman) read the notice convening the meeting; and the report and accounts, from which a few particulars were given last week, were taken as read.

The CHAIRMAN said he did not know that he had ever met the shareholders on any occasion with more pleasure than he did that day; and this arose from the balance-sheet being, if not the best, one of the best he had had to submit to them. As was stated in the report, the progress of the Company had been satisfactory. He found that, as compared with the corresponding period of last year, the receipts for gas had increased by £184; and this was to him a matter of considerable satisfaction. With the residuals, they had also done well; the aggregate increase being £278. The total revenue had reached £470 beyond that of the June half of last year. Looking on the other side of the account, it would be seen that under manufacture they had spent £159 more for coal; but they had made 701,000 cubic feet more gas. He found that the public authorities had consumed an additional 139,000 cubic feet; and the domestic supply had increased by 508,000 feet. The total expenditure was £315 more; but, as their receipts had increased by £470, the profits (which were £1657 in the corresponding period) were £1812 on this occasion. This enabled them to pay the dividends with ease, and to increase their small undivided balance by about £180. The report also stated that the Harrow and Stanmore Gas Bill had received the Royal Assent. He could not but congratulate the shareholders of the Stanmore Company in having obtained for the whole of their capital a guarantee of 6 per cent. under statutory powers. It was a very different property under statutory powers to what it had been hitherto. He could also congratulate the shareholders of the Harrow Company. As they were aware, for many years he had felt that Harrow did not move as he should have liked it to do; while Stanmore possessed vitality. It had been moving, and would still move; and it would give to them, he trusted, that which he had long hoped for—a little "go-aheadism." With respect to the Act, he might say that section 35 enabled them to put by an insurance fund, which was an admirable thing. The next clause had reference to a reserve fund; and, almost for the first time—if not for the first time—in gas legislation, it gave them the power to have an unlimited reserve fund out of profits. The Act also placed them under the sulphur clauses; and it enacted that the gas should not contain more than 20 grains of sulphur in any form per 100 cubic feet. Many large towns in England were not placed under these clauses, nor did towns on the Continent work under such a restriction; and yet it had been imposed upon them—a small Suburban Company. Their Engineer did not want the gas to be of less illuminating power or purity than that of any of the companies surrounding them. On several occasions, he had told him (the Chairman) that his tests—which were not so rigorous as they would now have to be, but they were sufficiently approximate—showed that the gas was very pure. He had always been animated by a desire to give the customers pure gas; but stimulated as he now would be by a penalty of £5 a day if he infringed the Act in this respect, no effort would be spared on his part to keep well within the limit. Before concluding, he mentioned that, in accordance with the provisions of the Act, the Harrow and Stanmore Companies would not become one before March next. The two districts were in juxtaposition; and both concerns were founded by the late Mr. John Chapman. "Union was strength;" and he believed that the union of the two undertakings would be for the benefit of the shareholders and consumers of both. By the new Act, they must reduce the price of gas 3d. within a mile of the centre of Harrow. They were not bound to do so beyond; but the Directors had resolved that it should be reduced throughout the whole district. He then moved the adoption of the Directors' report and the balance-sheet.

Mr. C. HORSLEY, in seconding the motion, referred to the Chairman's remarks as to the sulphur clauses; and pointed out that they would not come into operation for several years, which would give the Company time to put their works into order.

The motion was then unanimously carried.

On the proposition of the CHAIRMAN, seconded by Dr. F. W. LEE GLAISHER, F.R.S., a dividend was declared at the rates per annum of 7½, 7, and 5¼ per cent. respectively on the "A," "B," and "C" capital, all less income-tax.

The CHAIRMAN, in asking the shareholders to accord Mr. Chapman a vote of thanks for his continued exertions, observed that they were much indebted to him, both as Lessee of the Stanmore Gas-Works and Secretary and Engineer of the Harrow Company, for the great assistance he had given in carrying the Bill through Parliament.

Mr. HORSLEY seconded the motion, which was heartily agreed to.

Mr. CHAPMAN, in acknowledging the compliment, said it was a great pleasure to him to meet the shareholders under present circumstances. When their last meeting was held, they were passing through difficult times. They had a large amount of coal for which they had to pay a high price; and they did not know how the next balance-sheet would turn out. The price of coke and sulphate had, however, risen; and he might say that they had produced more sulphate from the coal used than he had any right to make, chemically or otherwise. But there it was; they had obtained the sulphate, and, moreover, they had sold it. He was also pleased that their Bill had passed through Parliament. He had done his best, although he should lose a considerable amount by parting with the Stanmore works. However, he had loyally carried out the desires of the Harrow Company; and he, like the Chairman, believed the arrangement would be an advantageous one to the shareholders and consumers of both Companies.

Mr. A. F. PHILLIPS, in proposing a vote of thanks to the Board, said he did not think the Chairman's fears as to the sulphur clauses would be so serious as he anticipated, although he quite agreed it was a hardship to put them upon Provincial Companies who could not always command a sufficient staff of men to allow someone to be constantly watching the quality of the gas. He trusted the shareholders would fully appreciate the way in which Mr. Chapman had aided the Harrow Company in carrying the Bill through Parliament. Although he had parted with the Stanmore works, he (Mr. Phillips) believed he would eventually find it to be as much to his benefit as if he had retained them in his own hands.

Mr. C. H. ROBBINS seconded the motion, which was carried.

The CHAIRMAN, in responding, referred to the cost of coal to the Company. Owing to the distance of the railways from the works, it cost them altogether 9s. 6d., or thereabouts, for the carriage of every ton of coal; while companies situated on the Thames could get their coal delivered to them for about 3s. 4d. or 3s. 6d. per ton. In point of fact, coal cost last year more than £1 per ton on the works; and, when they considered the low cost of coal delivered into the works in the Metropolitan district, then the 4s. 3d. which they charged for gas in Harrow was relatively cheap.

This concluded the proceedings.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. A. J. DOVE in the chair.

The CHAIRMAN said that before commencing the business, he was sorry to have to announce the decease of their Chairman (Mr. E. Horner). He was a man highly esteemed by all; and his business character and power had been of very great service to the Company. He was one of the original promoters of the concern; and he had been a member of the Board since its commencement.

Mr. T. GUYATT, in the absence of the Secretary (Mr. A. J. King), read the notice convening the meeting; and it was afterwards agreed to take as read the Directors' report and the accounts, a paragraph referring to which appeared in our issue for the 28th ult.

The CHAIRMAN said the accounts for the past half year were very favourable in all respects. They had carbonized less coal; and yet there was an increase in the gas-rental. This was to some extent accounted for by the considerable improvement that had taken place in the amount of leakage. Altogether, the business of the Company had been carried on very satisfactorily both by the Engineer (Mr. John Gandon) and the Secretary. He moved that the report of the Directors and the accounts be adopted.

Mr. J. ORWELL PHILLIPS seconded the motion.

Mr. R. HESKETH JONES pointed out that in the investment account there was an item of £228 for mains, &c.; and he suggested that if, instead of placing this sum to that account, it had been charged to revenue, the profits would have been reduced by £228, and they would thus have saved the 5 per cent. Government tax on that amount.

Mr. C. GANDON pointed out that £368 was written off for depreciation; and

Mr. H. W. ANDREWS (the Consulting Engineer) stated that the

£228 had been spent on new mains for a consumer, and it would bring them in a large amount of rental.

Mr. FINLAY remarked that, in the event of the Company being bought up at the end of the concession, it was better that charges of this kind should be placed to investment account than that the amount of the profits should be decreased by them. He thought that, in such matters, the Directors were more competent to judge of the course to take than the shareholders.

The motion was unanimously adopted.

A resolution was then passed adding £500 to the reserve fund (making it £6000), and declaring a dividend at the rate of 7 per cent. per annum, free of income-tax, on both classes of shares.

Mr. PHILLIPS next moved—"That the heartfelt regret of the shareholders at the death of the late Chairman (Mr. Edward Horner) be expressed, and that the sincere condolence of this meeting be offered to the late Mr. Horner's family."

Mr. FINLAY, in seconding the motion, said it was with much sorrow that he learnt of the death of Mr. Horner. He had been associated with him for something like 25 years, and more immediately connected with him in the management of a cognate Company for about 16 years. He had found him to be a valuable colleague; and he much regretted the loss they had sustained.

The motion having been carried,

The services of the Directors and the various officials were suitably acknowledged.

PROVINCIAL GAS AND WATER COMPANIES.

A few additional reports and accounts of Provincial Gas and Water Companies call for notice this week.

Gas Companies.

The report which the Directors of the Brighton and Hove Gas Company will present to the shareholders at their half-yearly meeting next Friday is very brief; but it records that the amount received from the sale of gas in the six months ending June 30 last was higher than in the corresponding period of 1893, chiefly due to an increase in the price. An improvement in the value of residuals is likewise reported. The quantity of gas sold was 438,659,500 cubic feet, which produced a revenue of £65,711; residuals realizing £18,430. The total receipts were £86,031. The expenditure incurred in the manufacture of gas amounted to £45,678, out of which £29,799 was paid for coal and conveying it to the works; distribution cost £6491; rent, rates, and taxes came to £2891; management cost £4608; and the total expenses were £60,942—leaving a balance of £25,089. The amount available for division is £25,153; and out of this the Directors recommend dividends at the rates of 11, 8, and 6 per cent. per annum, on the original, "A," and preference stocks, less income-tax. The quantity of coal and cannel carbonized was 41,473 tons; and the estimated production of residuals was as follows: Coke, 53,292 chaldrons (of which 11,916 chaldrons were used); breeze, 1557 chaldrons; tar, 439,545 gallons; and ammoniacal liquor, 915,091 gallons. Owing to the death of Mr. G. E. Forrest, the shareholders have to elect a Director in his stead; and as Mr. R. Hesketh Jones, J.P., has resigned his position as an Auditor, this vacancy will have to be filled

After the various reverses of the East Ardsley Gas Company during the past two or three years, it is pleasant to learn that they are now able to pay a dividend of 5 per cent., and carry forward a respectable sum. There is a continued increase in the consumption of gas; and everything seems conducive to still further improvement. During the past half year, 7 million cubic feet of gas were made, as against 6,826,000 cubic feet in the corresponding period of 1893. To produce this quantity, 750 tons of coal were carbonized, as compared with 730 tons.

The annual meeting of the Falmouth Gas Company was held last Thursday—Mr. R. M. Tweedy presiding. In their report, the Directors congratulated the shareholders on the satisfactory position of the Company, as shown by an increased revenue, notwithstanding a reduction in the price of gas by 3d. per 1000 cubic feet. The improvement was mainly due to increased consumption, which during the year had been more than 1½ million cubic feet. The prepayment meter system, introduced by the Manager (Mr. J. W. Buckley), in February last, had been found to answer admirably, especially for supplying small consumers with gas. There had been 65 of these meters fixed; and it was anticipated that this class of customers would rapidly increase. An interim dividend at the rate of 10 per cent. per annum was declared in February; and it was now proposed to pay one at the rate of 12 per cent. per annum for the half year, and to place £135 to the reserve fund. The Chairman, in moving the adoption of the report, said the increase in the consumption was the largest experienced since the works had been established—certainly since the Company obtained Parliamentary powers. If there was no disturbance in the coal trade, they hoped to reduce the price of gas still more. "Penny-in-the-slot" meters seemed to have "caught on;" and by the end of the year, he hoped they would have a hundred of them in use. It was gratifying to observe that the Corporation were improving the lighting arrangements of the town by using three-light lamps in some parts of it. The report was adopted; and it was decided to increase the remuneration of the Secretary (Mr. W. Corfield).

The report of the Directors of the Hastings and St. Leonards Gas Company (which was noticed last week) was submitted at the meeting of the shareholders last Thursday, and was described by the Chairman (Alderman Thorpe) as being the best presented within his memory. At Christmas, he said, there would be a reduction of 2d. per 1000 cubic feet in the price of gas, resulting in a benefit to the consumers of £2800. The penny-in-the-slot system was working most successfully. The dividends ordered to be paid were 12 per cent. on the £25 shares and 9 per cent. on the £20 shares.

The report of the Directors of the Lewes Gas Company for the six months ending June 30 last, which was presented at the ordinary meeting of shareholders last Wednesday, showed that the working had resulted in a profit of £1489; but the amount available for distribution was £1458. Out of this the Directors recommended a dividend of 4½ per cent., which would leave a balance of £249 to be carried forward. Reference was made to the resignation of Mr. G. Wilson, the Manager, and the appointment of Mr. L. Monk as his successor. The Chairman (Mr. J. Broad), in moving the adoption of the report, said he thought the proprietors might regard the results as satisfactory, all things considered. There had been an increased consumption of gas; and the Directors had been fortunate in getting more for their residuals, which augmented their balance. At the same time, they thought it wise to pay only 4½ per cent., as repairs to the works would probably be required during next summer. Referring to the change in the management, he said Mr. Monk's testimonials and previous record were very satisfactory; and he trusted that, under his supervision, the concern would be restored to its former prosperity. Alderman White, in seconding the motion, remarked that in the accounts there was no statement as to where the reserve fund was invested, or any record of interest arising from the money. The Secretary (Alderman E. Hillman) said the Company had no reserve fund. Alderman White pointed out that, in the event of a gasholder breaking down, they had nothing to fall back upon, and consequently money would have to be borrowed, for which the shareholders would have to suffer. The report was then adopted, and the dividend declared. The retiring Directors and Auditor were next re-elected; and the proceedings closed with a vote of thanks to the Chairman.

The thirtieth annual meeting of the Plympton District Gas Company was held at the works, Underwood, on Friday, the 31st ult. The gas and meter rental showed a gradual increase; and the sums received on account of residuals were in excess of recent years. The net profit on the year's working was £213. A dividend of 7 per cent. was declared; leaving a balance of £38 to be carried to the reserve fund.

The half-yearly meeting of the Richmond Gas Company last Thursday week was an interesting one. In the course of his remarks, the Chairman (Mr. T. J. Carless) congratulated the shareholders on the satisfactory result shown by the accounts; but before dealing with the figures, he referred to the losses the Company had sustained by the death of two of the Directors—Mr. G. T. Noyce and Dr. Duncan—and by the resignation, under medical advice, of Mr. E. B. Blott, who had held the position of Secretary to the Company for 25 years. It was, he said, proposed to appoint their Engineer (Mr. T. May) to the vacancy. He had assisted and acted for Mr. Blott, and was thoroughly capable of carrying on the duties of both offices. In compliance with a petition received from the residents in the added area of the borough, the Directors had decided to make the charge for gas 3s. 1d. per 1000 cubic feet to all consumers; and after the close of the current quarter, the price would be reduced to 3s. After pointing out the differences in the various items of the revenue accounts for the past and the corresponding half year, the Chairman stated that there had been an increase of 4 per cent. in the quantity of gas sold; but owing to the reduction of 2d. per 1000 cubic feet, the amount received showed a slight reduction. There was a satisfactory increase in stove-rental of 14 per cent.; and the residuals had realized better prices. It was proposed that dividends of 5 and 3½ per cent. for the half year should be paid, and that the balance of net profit—£7450—be carried forward. The report was adopted; the proposed dividends were declared; and resolutions were passed, granting Mr. Blott a retiring allowance, and appointing Mr. May to the office of Secretary.

The half-yearly meeting of the Rugby Gas Company was held last Friday week; and the report which was presented showed that the receipts for the half year ended June 30 came to £6304; and the expenditure, to £3551, leaving a balance of £2753 to be carried to the profit and loss account. This added to £3211—the net balance after payment of the dividend for the half year ended Dec. 31 last—and £10 interest on money deposited, less £152 interest on mortage, and £650 carried to capital account for depreciation in respect of the old gasholder, formed a net balance of £5172. An interim dividend at the rate of 11 per cent. per annum on the paid-up share capital—amounting to £1644—was recommended. The report, which stated that the affairs of the Company were in a satisfactory condition, was unanimously adopted.

At the annual general meeting of the Sunderland Gas Company last Thursday—Mr. J. Stokoe in the chair—the report, which was noticed in the JOURNAL last week, was adopted. In the course of his remarks in submitting the usual motion, the Chairman stated that the make of gas had increased nearly 4 per cent. as compared with the previous year. This was largely owing to the increased number of gas-engines and cooking-stoves in use. There was a very handsome profit realized on the year's working, largely owing to the low rate at which the Directors were enabled to make the new contract for coals in the previous year. This year, as the shareholders knew, there had been a decided advance in the price of coals; and they could not expect to have the same profit resulting from the working. But there was no reason to anticipate a serious reduction, such as was likely to affect their position. Residuals were in active demand at fair prices; so, as the Directors mentioned in the report, the prospects of the Company were still of an encouraging character. The Chairman concluded by referring feelingly to the loss the Company had sustained through the deaths of their able Senior Engineer (Mr. Hawksley) and Mr. J. S. Wilson, one of the Directors. The dividends recommended were declared; and the proceedings closed.

At the recent half-yearly meeting of the Tonbridge Gas Company, it was reported that, in consequence of the increasing consumption of gas, the Directors had decided to make certain extensions, including a new large gasholder, three new benches of retorts, and a new coal-store, with the purchase of two acres of land; the estimated cost being £7000. This amount will be raised by the sale of £4500 of 7 per cent. debenture stock. Dividends of 10, 7, and 5 per cent. were declared.

The shareholders of the Victoria Newmarket Gas Company, Limited, held their half-yearly general meeting on the 27th ult., under the presidency of Mr. C. Diver. The Manager and Secretary (Mr. J. H. Troughton) read the report of the Directors, in which they stated that the balance of profit for the year ending July 31 last available for division was £3945, out of which they recommended a dividend at the rate of 11 per cent., free of income-tax. This would absorb £3300, and leave a balance of £645 to be carried forward. The report was adopted. Votes of thanks were then accorded to the Directors, as well as to

Mr. Troughton, who, at the close of the proceedings, conducted the shareholders over the works, which they found had been maintained in good condition.

Water Companies.

The result of the operations of the Barnstaple Water Company during the half year ending June 30 last was a disposable balance of £1231, out of which it has been agreed to pay a dividend at the rate of 10 per cent. per annum on the old ordinary shares, and 7 per cent. on the new ordinary shares (free of income-tax). After meeting these, £386 will remain to be carried forward. At the recent meeting of the shareholders, much gratification was expressed at the satisfactory position of the concern.

The net revenue of the Brymbo Water Company for the past year amounted to £1631, which made, with the balance of £196 brought forward, £1827. The interim dividend at the rate of 4 per cent. and the interest on loans absorbed £1024, which leaves £803 available for distribution. It has been decided to pay a dividend for the last half year at the rate of 5 per cent. per annum, free of income-tax. The business of the Company continues to gradually increase; 78 additional houses having been connected with the mains during the year—making the total number supplied 3139. The shareholders have authorized the Directors to raise the balance of the unissued capital—viz., 500 shares of £10 each.

It was reported at the recent meeting of the Dorking Water Company that the receipts for the half year ending June 30 last had amounted to £1269; and, deducting the disbursements, there remained a profit of £832. After payment of the interest on mortgages, and on amounts paid in advance of calls on shares, there was left a net profit of £741. Adding to this £34 brought forward from the previous six months, the sum available for division was £775. The Directors recommended the payment, on Oct. 1 next, of the usual interim dividend at the rate of 5 per cent. per annum on the called-up share capital; and this was agreed to.

ILKESTON CORPORATION GAS SUPPLY.

The Working in the Past Financial Year—Reduction in Price.

At the usual Meeting of the Ilkeston Corporation last Tuesday, the report of the Gas Engineer (Mr. F. C. Humphrys) was read, and the accounts, as audited by the elected Auditors, were presented. The Chairman of the Gas Committee (Alderman Beardsley) moved their adoption, and referred to the year's working as having been most satisfactory under very difficult and trying circumstances. He also proposed a reduction of 2d. per 1000 cubic feet in the charge for gas; making the price 2s. 5d. instead of 2s. 11d. The report was unanimously adopted. In the course of his report, Mr. Humphrys stated that the quantity of gas made in the past financial year was 50,425,900 cubic feet; being a decrease of 1,164,800 cubic feet on the preceding year. This, he said, was easily accounted for by the exceptional period passed through during the stoppage of coal. The gas accounted for was 45,569,200 cubic feet; leaving 9·4 per cent. unaccounted for. The quantity of coal used was 5036 tons; so that 10,013 cubic feet of gas were produced for each ton carbonized. The coke sold was 2386 tons; tar, 57,255 gallons; and sulphate of ammonia, 61 tons. During the winter, coke was much wanted; and it fetched a good price. Tar being unsaleable, arrangements were made to burn it instead of coke for heating the retorts. The arrangement proved to be quite satisfactory; and it can now be utilized at any favourable opportunity. The quantity of tar so burnt was 14,860 gallons; and, as a natural result, a considerable amount of coke was rendered available for sale, and was sold. The present number of consumers is 1285, as compared with 1271 last year. The public lamps number 297, of which 51 are of higher illuminating power than usual. The length of mains laid during the past year was 3521 yards, of which 611 yards were in place of others taken up; the total length being about 21¼ miles. There are now 70 cookers on hire, besides a good number belonging to the consumers. Mr. Humphrys stated that the experiment recently introduced with prepayment meters seemed likely to be very successful. In fact, it was not possible to get the meters fast enough to supply the demand. He added that the whole of the works and plant were in an efficient state of repair. Referring to the trouble caused by the unsettled state of the coal market, which had rendered the year's working one of exceptional anxiety, he remarked that when, within five or six weeks of Christmas, they were reduced to a very small stock, it became necessary to buy in the open market, and under every possible disadvantage. Nearly 1500 tons of coal were so bought; and though these deliveries put the department to a great expense, the supply of gas to the district was throughout fully maintained. In the three months ending Midsummer, there was a large increase in the quantity of gas sold; the quarter's rental coming to upwards of £100 more than in the corresponding three months of 1893. The cost of manufacture in the past year was, of course, heavy; and amounted to £7488. Out of this, coal cost £3704; wages and distribution expenses came to £1885; and interest and repayment of loans to £1899. But as the total receipts for gas and residual products were £8445, the results were far more favourable than at one time seemed possible; and they fully warranted the consideration of a revision of the scale of charges.

The Transfer of the Goole Gas and Water Undertakings to the Local Board.—An extraordinary general meeting of the Goole and District Gas and Water Company was held last Thursday—Mr. Percy Tew presiding. The Directors congratulated the shareholders upon the completion of the sale of their undertaking to the Goole Local Board. Last year a dividend of 9 per cent. was paid, and out of the proceeds arising from the sale there has been handed to the shareholders a sum of £10 17s. 6d. per share in respect of each share (£7 10s. paid), and there remained for division a balance of £1909 6s. 6d., which the Directors recommended should be distributed by a further sum of 6s. per share. A resolution was passed to wind up the affairs of the Company.

GAINSBOROUGH WATER SUPPLY.

A Local Government Board inquiry was held at Gainsborough last Tuesday, by Major Tulloch, to consider the proposal of the Local Board to substitute a new scheme of water supply for that sanctioned in 1893. The original scheme included a well 250 feet deep, with an adit or heading about 25 feet long from the bottom of it, through which the water in the existing boring would have been led into the well; and new and elaborate pumping machinery was to have been fixed therein. It will be seen, therefore, that in this scheme everything depended on the efficiency of the existing boring, and the connection between it and the well. Continuous pumping, however, from the boring, which is only 10 inches in diameter at the bottom, indicated that it would prove too small to supply more water than is at present required by the town at the depth at which it was proposed to tap it; and therefore it would have been necessary to carry the well deeper than 250 feet in order to provide for the increased demands of the future. The matter was thoroughly discussed between the Water-Works Committee and their Engineer (Mr. Jabez Church, M.Inst.C.E., F.G.S.); and finally it was decided to give up the well altogether, and make a new boring 100 feet deeper than the present one, and 18 inches instead of 10 inches in diameter, and so secure a new and independent supply of water. This will involve the employment of a bore-hole pump instead of the ordinary type of well-pumps; but the existing bore-hole pumps will be maintained, so as to be a stand-by in case of accident or during repairs to the new machinery. The new boring will be large enough to allow of the pump being fixed as deep as 300 feet below the surface, if necessary. There is no doubt, therefore, of the new supply being sufficient for the requirements of the town for many years to come. At the inquiry last Tuesday, no opposition was offered to the transfer of the loan from one scheme to the other; and therefore it was only necessary to explain the new one to the Inspector, and point out its advantages over the first scheme. This was done by various members of the Board, as well as by Mr. Percy Griffith, representing Mr. Church. At the close of the inquiry, the Inspector visited a plot of land which the Board are proposing to purchase for the construction of a reservoir. The amount of the loan applied for is £13,335, which includes the new boring, pumping machinery, engine-house, rising main, and the land for the reservoir.

BORE-HOLE WELLS FOR TOWN WATER SUPPLY.

At the recent Meeting of the British Association at Oxford, a paper on the above subject was read by Mr. H. Davey, M.Inst.C.E. It was supplementary to a communication submitted by him at the Cardiff meeting of the Association; and as it contained a description of one of the most important examples of work executed under the author's system—viz., that of the Netherley pumping-station of the Widnes Water-Works, which are under the management of Mr. Isaac Carr—we give some extracts therefrom.

In procuring water for a town's supply, it is the usual and necessary practice to provide duplicate pumping-engines; and where two engines are made to pump from the same well, it must be very large, so that it may accommodate two sets of pumps. Such wells are usually from 12 feet to 14 feet in diameter. To sink such a well in the ordinary way is a very long and costly undertaking, especially if soft strata are met with, where lining becomes necessary. On the completion of the well, it may be necessary to drive adits to increase the water supply. A simple bore-hole is made very cheaply and very expeditiously. Four 30-inch bore-holes can be put down in a very small fraction of the time required to sink a 12-feet well.

Instead of making a large well, the author puts down four bore-holes to accommodate the pumps for duplicate pumping-engines—a pair of pumps to each engine. The bore-holes being completed, the pumps are lowered into them, and coupled up to the permanent engines. Immediately this is done, the water found in the holes can be pumped and supplied to the town. Should it be insufficient, then a small well would be sunk in the dry to the bottom of the bore-hole pumps. The water being kept down by the pumps, the bore-holes at the level of the pumps would be connected to the centre well, and adits driven to collect more water. Should the holes yield sufficient water, it would not be necessary to sink the well.

It would be absurd to advocate any particular system of well-sinking as being universally applicable. This system, however, of making wells offers advantages under favourable conditions, but the advisability of its adoption in any particular case must be a matter of judgment with the engineer planning the work.

The bore-holes in question, two in number, are sunk in the old red sandstone rock, and are placed 20 feet apart, each bored to a diameter of 30 inches for a depth of 200 feet, and to a reduced diameter of 18 inches for a further depth of 200 and 300 feet respectively; thus making the first hole 400 feet and the second one 500 feet deep. On the completion of the boring, the water stood from 70 to 80 feet from the surface of the ground. At this time an old engine on the same site was pumping 1¼ million gallons a day. The main pumps were then lowered into the bore-holes, each pump extending to the bottom of the large part of the hole, 200 feet from the ground-level. In this position, the pumps were suspended from a cast-iron bed-plate supported on a concrete foundation formed round the top of the holes; a block of oak being inserted between the head of the pump and the bed-plate. Thus suspended, the pumps work without the slightest unsteadiness.

It must be observed that no temporary pumping plant being required, the main engines were erected while the bore-holes were being made, so that on the completion of erection of the engines and pumps, water could be at once supplied to the town; but it remained to be proved what was the quantity of water available. The engines were made for the purpose of pumping 2¼ million gallons a day; but it was found that, working up to their utmost capacity of 2¾ million gallons, the full yield of the bore-holes was not reached.* On starting the new pumps

* An account of the preliminary trial of the pumping plant appeared in the JOURNAL for Aug. 1, 1893 (p. 227).

it was found that, when pumping 2¾ million gallons per day, the water level was lowered to 100 feet from the surface of the ground. Had the yield of water been insufficient then, whatever water there was might have been sent continuously to the town, while a small well was sunk, and adits driven (say) at a depth of 180 or 200 feet from the surface, for the purpose of collecting more water. In chalk, this would probably have been necessary; but, in sandstone, water circulates more freely. In this and in other cases in sandstone it has not been necessary to drive adits. Similar bore-holes and pumps have been put down in red sandstone at Fleetwood, Kingswinford, and other places, with equal success.

The motive power at the Netherley station consists of a 230-horse power surface-condensing engine, employed to pump from the bore-hole into a masonry tank by the engine foundations, from which tank the water is forced by the same engine to a reservoir at an elevation of 260 feet. The engine is made to work the force-pump by means of a tail-rod from the low-pressure cylinder; the bore-hole pumps being worked by means of rocking levers actuated by a connecting-rod from the cross-head of the engine. There is no fly-wheel or rotary motion; but a very simple expedient is resorted to in order to enable the engine to work expansively, and not only so, but to work with a steam distribution. There is a separate expansion-valve to each steam-cylinder; also cushioning-valves on the high-pressure cylinder. In non-rotative engines, where the cylinder clearances are necessarily larger than in rotative engines, compression is an important element of economy.

The water raised by the bore-hole pumps is lifted to the reservoir by means of a double-acting force-pump worked direct from the engine piston. The bore-hole pumps are made of lap-welded steel tubes, with wrought-iron flanges screwed on. A steam-winch is provided for drawing the pump-rods and for changing the working parts of the pumps. For indicating the water-level in the bore-holes, a pipe is put down outside the pumps. At the top of the pipe in the engine-room is fixed a sensitive pressure-gauge. Below the gauge is a branch communicating with a small air-pump worked by the engine. The pipe is thus kept filled with air, and the hydrostatic pressure on the outside of the tube is shown on the pressure-gauge. The cost of the engine and pumps was £6000, or at the rate of £30 per pump-horse-power; and the total cost of the engine, pumps, bore-holes, and buildings, was about £9700, or £48 10s. per pump-horse-power.

THE HERMITE PROCESS FOR THE TREATMENT OF SEWAGE.

In the JOURNAL for April 17 last (p. 698), we gave an account of the experiments which had been carried on at Worthing with the object of testing M. Eugène Hermite's process for the treatment of sewage by electrolyzed sea water. It may be remembered that a report adverse to the system was presented to the Town Council by the Medical Officer of Health (Dr. Kelly); and, by some inadvertence, the conclusions arrived at by him were published before the document had been adopted by that body. The opinion formed by Dr. Kelly was based on the results of chemical and bacteriological analyses made by Drs. Dupré and Klein; and those who were interested in the process came to the conclusion that these chemists could not have been furnished with fair samples of the treated sewage. They therefore asked the public to suspend their judgment until Sir H. Roscoe and Dr. A. Ruffer, who were investigating the process on behalf of the British Institute of Preventive Medicine, had made known their views thereon. The last-named gentleman, in conjunction with Mr. J. Lunt, B.Sc., has since made a report which has been laid before the Council. The first point considered was whether the electrolyzed sea water containing 0·5 gramme of available chlorine per litre, as estimated by the arsenite test, was of sufficient strength to sterilize sewage, and was also stable enough for use in the house supplied with it. Two experiments were carried out with the view of obtaining conclusive evidence on this matter; and they showed that, while the deodorizing power of the liquid, when freshly prepared, was perfect, it was useless as a bactericidal agent 24 hours after having been made. Further experiments were, however, conducted; and these proved that the stability of the solutions increased with their strength. For example, whereas the 0·5 gramme solution lost 90 per cent. of its strength in the first 24 hours, a solution containing 1·05 grammes per 1000 only lost 7 per cent. on the first day, while at the end of 46 days it still contained nearly 0·5 gramme. A solution containing 0·75 gramme per 1000 lost 34 per cent. on the first day; and after the 46 days, it had fallen to 0·33 gramme. The solutions of higher strength are, however, not so economically produced as are the weaker ones. It was found that, if the amount of the current, or rather the length of time used for the production of a 0·5-gramme solution, were doubled, the solution did not contain twice the quantity of chlorine—viz., 1 gramme per 1000—but only 0·75 gramme. If the current, therefore, were augmented 100 per cent., the increase in yield would be only 50 per cent. It is just this increase that renders the solution relatively stable. The action of the liquid on bacteria was next examined. In these experiments, from 10 to 15 grammes of fæcal matter were weighed out, and to it a like proportion of the urine voided at the same time was added. This was then mixed with a proportionate quantity of electrolyzed sea water corresponding to 2 gallons to the whole stool; and it was found that the supernatant fluid was quite sterile, with the exception of a few resistant spores, and that the outside of the fæcal matter was also sterile, but that the bacteria inhabiting the inner part of the fæces had not been destroyed. In some cases, the experimenters mixed the two thoroughly, and, by means of a glass rod, broke up all the lumps of the fæces; and it appeared that, when these had been reduced to a pulp, and the electrolyzed fluid of 0·8 gramme strength or more was allowed to act on them, they were perfectly sterilized, and remained sterile as long as the access of air was prevented. If, the air was allowed to contaminate them, bacteria again grew on the surface of the liquid after some days, although the smell never returned. The investigators also made some experiments with putrid liquid sewage taken at the Metropolitan outfall at Crossness; and they found that this was comparatively easily sterilized and deodorized—one volume of 0·75 gramme strength of the Hermite fluid being sufficient to sterilize an equal volume of this sewage. The following are the conclusions they arrived at: (1) That a solution of electrolyzed sea water of less than 0·75 gramme of available chlorine per litre is useless as far as sterilization of fæcal matter is concerned; (2) that sewage treated with a sufficient quantity of electrolyzed fluid of 0·75 gramme of available chlorine per litre or more can be made quite sterile, provided the fæces are well broken up and mixed with the electrolyzed fluid; (3) that the deodorization of sewage with the electrolyzed fluid is immediate.

The Hermite system has also been investigated by the Special Analytical Sanitary Commission of the *Lancet*. The chemical and bacteriological reports appeared in the issue of that publication for May 26 last; but they have been reprinted in a separate form. The investigation conducted by the Commission was exhaustive; and they expressed the opinion that the production from sea water of a powerful deodorant was an innovation which should afford very material aid to sanitary progress; and that its substitution for other and more expensive agents in seaside towns and villages would doubtless confer many advantages. While exerting a specific disinfecting action, it appeared to be used up and destroyed to a much less extent by organic matter than other disinfectants. Some independent tests of the process have likewise been carried out by Mr. R. A. Cripps, F.I.C. His experiments, which were conducted with great care, go to show that the Hermite system is capable of completely destroying the life of the bacilli of sewage when the electrolyzed sea water is added in equal quantity; while an admixture of 9 per cent. of it is insufficient to effect complete destruction, though it has a decidedly beneficial effect, and prevents the evolution of offensive gases. M. Hermite's apparatus was described and illustrated in a recent number of the *Electrical Review*.

Reduction in the Price of Gas.—The Sowerby Bridge Local Board, at their meeting last Wednesday, decided to reduce the price of gas in the Mytholmroyd and Brearley district from 5s. to 4s. 2d., and in the Soyland district from 3s. 7d. to 3s. 4d. per 1000 cubic feet.

The Large Gasholder at Rochdale.—The large gasholder which Messrs. S. Cutler and Sons have just completed at the Rochdale Corporation Gas-Works, as recorded in the JOURNAL last week, is provided with guide-framing constructed on Cutler's patent system, in accordance with a design selected by the Gas Committee, submitted in response to the advertisement which appeared in our columns. The holder is 150 feet in diameter, and is in four lifts—rising to a height of about 136 feet.

The Nottingham Corporation Gas and Water Accounts.—The accounts of the Nottingham Corporation Gas and Water Departments for the year ending March 31 last have been investigated by the Borough Auditors; and their reports thereon were to come before the Council at their meeting yesterday. With regard to the gas undertaking, the income on revenue account was £232,322; being an increase of £7648 on the previous year. The expenditure was £164,809; being an increase of £9639. There was consequently a decreased profit of £1991. The loss resulting from the coal crisis only affected the accounts to the extent of £3818. Referring to the increased expenditure, one of the Auditors alludes specially to three unusual items in the accounts—viz., £15 14s. 2d., refreshments and carriage hire; £24 17s., luncheon; £21 5s., special tea at Basford in connection with a visit of the Committee and the Manchester District Institution of Gas Engineers. He observes: "As such payments would undoubtedly be disallowed by a Government auditor, it is clearly the duty of a borough auditor to call your attention to them for general information, and to elicit the opinion of the Council thereon for future guidance." With regard to the water undertaking, the income on revenue account was £66,257—an increase of £647 as compared with the year 1892-3. The expenditure was £63,997—or £2001 more than before. The net profit was £2280, or a decrease to the extent of £1354. There was a serious rise in the working expenses; and the cost of coal was higher.

The Opening of the Thirlmere Water-Works.—At the last meeting of the Manchester City Council, Alderman Sir J. Harwood stated that, since the previous meeting, a large amount of rain had fallen at Thirlmere, and the lake was filled up to the 20-feet level. This was a state of things they did not expect till the end of October or the beginning of November. This fact, together with other circumstances, had caused the Water Committee to modify their intentions with regard to the opening of the works. The Council must bear in mind that if they did not open them before the winter, they would have to wait till at least next April. This meant that the water in the lake would be standing. A long frost might come, and this would place them in a position of difficulty in regard to obtaining a supply from Thirlmere. It would be a simple matter to carry out an opening ceremony in Manchester. But the Committee thought it best that the opening should be at Thirlmere; and they proposed that the Prince of Wales should be asked to perform the ceremony in October. The works were of a magnificent character, and were a fine monument of the skill of the Engineer (Mr. G. H. Hill, M.Inst.C.E.). At present they were the largest works of the kind in England. Mr. Wainwright asked if there was any necessity for turning on the water, as this would mean the payment of a large amount in rates. Alderman Harwood said the rates would commence when the Corporation were "in beneficial occupation" of Thirlmere. The Committee did not care to run the risk of waiting till next spring. The Engineer warned them that there might be danger. Replying to a question, Sir John said that altered circumstances—arising from a great rainfall—had caused the change in the proposals of the Committee. They had now 17 days' more water in stock than they had in August. If the Council wished to save the £10,000 in rates by running the risk of mischief happening in the winter, he had nothing to say. But the Committee much preferred not to run the risk. A suggestion was then made that Sir John Harwood should himself perform the opening ceremony—an arrangement which it was stated had the unanimous approval of the Sub-Committee. The matter was left with the Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week the Glasgow Corporation gas and electric lighting accounts came before the Town Council for approval. The total revenue in the gas department was £569,546; and the total expenditure, £455,928. In addition, £42,304 was written off for depreciation, and £67,167 was required for financial purposes, which left a free balance of £4145. Last year's balance of £126 fell to be added; and the loss upon the electric lighting undertaking for the past year (amounting to £607) having been deducted, the Committee added £3500 of the balance to the fire insurance fund, and carried forward a sum of £164. The sales of ammoniacal liquor produced £21,000 more than last year. The number of meters in use at the close of the year was 162,074—an increase of 3175 during the year; and the number of gas-stoves on hire was 10,999—an increase of 218. During the year 1593 apparatus for cooking and heating were sold. In proposing the adoption of the accounts, Mr. Mitchell, the Convener of the Gas and Electric Lighting Committee, said that the revenue of almost £570,000, notwithstanding the reduction of 3d. per 1000 cubic feet (equal to nearly £45,000), was still only short of 1893 by about £25,000. This was not, as many people were inclined to think, owing to their accounts being almost as large as before the reduction in price, but was due principally to an increase of £29,000 in the revenue from residual products, and also to continued economy in the cost of production at the various works. For the first time in many years, the sale of gas had slightly decreased; but when they considered that the year referred to was one of exceptionally clear weather, and that trade in many departments was dull and sluggish, curtailing the requirements of gas for public work and motive power, such a state of matters was only what might be expected, and which a period of better trade would speedily reverse. It would have been exceedingly agreeable to the Gas Committee to increase still further their popularity with the Council and consumers, and to have been able to recommend a less price than 2s. 6d.—notwithstanding it was the lowest price in the history of the gas undertaking; and what they might have done in normal times not even the Chairman himself could tell. But, face to face as they were with the present unfortunate coal strike, and with no contracts arranged for the current year, they felt that they were shut up to the recommendation in the report that the price be continued as at present; and from their past experience of the Gas Committee, it would be at once understood that they would take the first opportunity of reconsidering this most important matter to the advantage of the consumers. In the electric lighting department, they had also a cheering statement to present. The revenue had more than doubled; the number of consumers had increased from 108 to 378, as at May 31 last; and the loss on working had decreased from £1773 to £607. It might perhaps seem strange that, with a loss on the year's operations, it should have been recommended, and agreed to, that the price for private lighting should be reduced, from June 1 last, 1d. per Board of Trade unit; being equal to a sum of about £2300 on last year's revenue. But it would be observed that the public lighting had been the cause of last year's loss; and with an anticipated readjustment of the rate per lamp for the present year, and the large increase in the number of consumers, secured and prospective, the Committee felt that they were entitled to look forward to a different result in May, 1895, and were warranted in giving the present relief in price to encourage the increased use of electric lighting. The works in Waterloo Street, under the management of Mr. Arnot—who also deserved the Committee's thanks—were being increased to meet the demand which was anticipated during the coming winter; and additional mains were also to be laid down, at a cost of £6000, in extending the lighting area towards the West-End Park, from which locality numerous applications for the light have been received. The accounts were adopted.

A small trouble has arisen in regard to the arbitration in connection with the transfer of the Falkirk Joint-Stock Gas Company's undertaking to the Corporation of Falkirk. Arbiters have been appointed, but not an Oversman as yet; the Gas Company having discovered that the proceedings have not been, as they think, regularly gone about, in respect that the Corporation did not give notice of their intention to treat, as required by the Lands Clauses Acts. They have accordingly brought a suspension and interdict in the Bill Chamber of the Court of Session, to have the proceedings stopped on that ground. The case was heard by Lord Kyllachy on Thursday. His Lordship said that it seemed to him to be a very useless question to try; but if they desired to test a point in the law of compensation, he would give them the opportunity. He would pass the note sending the case to the Court of Session, and continue the interim interdict; but he hoped that no more would be heard of the matter, as the difference between them was insubstantial. Now, the difference may be insubstantial; but in view of the fact that it would be open to any ratepayer, in the event of his being dissatisfied with the result of the arbitration, to set the whole of the proceedings aside on the ground of irregularity, it is safer to be correct in every movement. The Gas Company are therefore right in seeing to the procedure. It would be an easy matter for the Corporation to give the desired notice; but, as has been apparent all through, the Corporation are not disposed to save expense to the ratepayers.

The Aberdeen Corporation gas accounts were formally adopted by the Town Council on Monday. I was in error the other week, when I said they were to run from May 15. This had reference to the date from which assessments are to run; the financial accounts are to be closed on July 31 of each year. Mr. Johnston, the Convener of the Gas Committee, in moving the adoption of the accounts, said the ten months dealt with had been most successful—having left them with a credit balance of £7670, which, however, was reduced by £922, the adverse balance on the preceding year. The reduction in unaccounted-for gas to 7·6 per cent. had resulted in a saving to the Corporation of £1480. The new gasholder at Gallowhill was proceeding most satisfactorily, and was expected to be ready for use about a year hence. The holder will, it is anticipated, give them storeage capacity for many years to come. Regarding the accounts in the electric lighting department, the Convener had the customary "live in the future" story to tell. They had, he said, incurred a loss of £292, which he accounted for by their having started their installation at the end of February, when they had the worst of the lighting season before them; but he thought that, with a full lighting season, they might manage, if not to wipe off the adverse balance, at least to make ends pretty nearly meet. He expects a great deal. Looking into their accounts, I find that they had a revenue of £237, and their working expenses amounted to £289. How they make out a loss of £292, I cannot imagine. They have a capital of £21,020, upon which interest will have to be paid at the rate of at least 3½ per cent., which would amount to £682 a year; then they ought to lay aside 10 per cent. for depreciation and sinking funds, which would amount to £212 more. Adding these to the working expenses, the total amounts to £1183, from which the revenue of £237 deducted leaves a deficit of £846. This is not a very good record; and if Mr. Johnston expects to be able to meet that out of profits derived from 47 customers, he must indeed possess a very sanguine temperament.

The installation of incandescent gas lighting which has been fitted up by the Incandescent Gas-Light Company in Nicolson Square, Edinburgh, is a decided success. The Lighting Committee of the city did well to select a square for lighting, where the all-round effect can be better seen than when, as in thoroughfares, there is reflection from, or absorption by, the fronts of houses. In this case, the full effect of the light is obtained; and the result is that the space, which used to be a dark and dismal one, is now one of the best-lighted parts of the city. The square is a small one, containing nine lamp-pillars; and the incandescent burners have been fitted on them. They are of the "D" pattern, consuming from 3 to 3½ cubic feet of gas per hour, and giving 80-candle power each. The lanterns are square, and have been supplied by the Lighting Committee. By-and-bye (which means a good while yet), the thoroughfare which passes one end of the Square will be lighted by electricity; and then the citizens will have an opportunity of comparing the two lights, both as to effect and cost.

The Forfar Gas Corporation have concluded their labours in connection with the filling up of the vacancy caused by the death of Mr. D. B. Esplin, their late Manager. The result is that Mr. Forbes Waddell, Manager to the Blairgowrie Gas Company, has obtained the post. As I stated last week, there were 46 applicants for the appointment, but these were cut down to ten; and of the ten, Mr. Easson, of Perth, withdrew, for the reason stated last week. There were thus nine left. Of these there were four proposed; and Mr. Waddell was appointed by 8 votes to 6. He has been scarcely eighteen months in Blairgowrie; but he has done good service, having been able to reduce the price of gas from 6s. 6d. to 5s. 3d., and to increase the consumption of gas for cooking and heating, as well as to reduce the coal account by 20 per cent. His departure from Blairgowrie is very generally regretted by the community. Prior to going to Blairgowrie, he was for a short period at Tain, immediately after the Corporation there took over the gas undertaking; and his departure from that place was also matter of regret by his employers. During his short stay in Tain, Mr. Waddell reconstructed the works and put the distributing plant in order; and he was able to reduce the price of gas by 33½ per cent Before he went to Tain, he was carbonizing foreman in the Dawsholm works of the Glasgow Corporation. He holds a first-class certificate in "Gas Manufacture."

The Dumfries Gas Commission have overdrawn their bank account by £5680, which is a large sum on which to pay heavy bank interest; and at a meeting of the Commission on Thursday, it was suggested that a loan for the amount should be negotiated. This, it appears from the explanation given by the Treasurer, is being kept in view by the Committee, who are only waiting till they can include the cost of new purifiers in the loan. Where it can be afforded, owners of gas-works are always better to have a reserve fund to fall back upon for incidental expenditure; but, of course, in the vicissitudes of working an undertaking, it is not always possible to attain that advantageous position.

It has been decided by the Lockerbie Gas Commissioners to introduce automatic prepayment meters, with a view to reaching a wider range of customers, and thereby extending their gas consumption. I hope this will tend to help them out of their difficulties.

The Carnoustie Gaslight Company held their thirty-ninth annual meeting on Wednesday, and declared a dividend at the rate of 7½ per cent. for the year. A vote of thanks was accorded to the Directors for the energetic and successful manner in which they coped with the disaster which befell the gas-works in the great gale of last November, when the chimney was blown down and the retort-house wrecked.

I cannot say whether it be a sign of returning prosperity in trade in Dundee or not, but any way it is very gratifying to learn that, during the month of July, the increase in the gas revenue in the city was from £1244 in July of 1893 to £1837; and that, for the three months of the present financial year which have elapsed, the total revenue has been £6847—an increase of £410 upon the amount collected in the same period of last year.

The Scotch coal strike has now lasted eleven weeks; and, contrary to my expectation, it does not yet show much sign of terminating. As yet the masters, with the exception of eight of the smaller ones, are firm in resisting the demands of the men's leaders. On the part of the men, it is generally understood that many of them would willingly return to work, except for the close picketing which is maintained. A number went back to work at an advance of 6d.; but on Tuesday a conference of delegates was held in Glasgow, at which it was resolved to order them all out on strike again. This resolution has only been partially successful, as a number of men have continued at work in spite of pickets. So far there has been little disturbance of the peace; but a conflict between the police and a body of pickets took place on Thursday in the Lesmahagow district, which resulted in 15 men being injured. The latest information is that there is a proposal for a compromise, on the footing of the men going back to work on a 6d. advance, and steps being then taken to form a Conciliation Board. This comes from the men's side; the masters do not seem to have been consulted. They are not likely to adopt the proposal yet. The amount to be derived from England this time has not yet been announced; but it is expected to be smaller than usual.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 8.

Sulphate of Ammonia.—The market seems positively unable to extricate itself from its present position; and there is no perceptible movement in any direction. The absence of a satisfactory demand naturally causes a weak feeling, which is, however, hardly exhibited in the prices; the latter remaining almost stationary. Rarely has there been so little speculative business; and this is easily understood. The "bears" are afraid to accept the low prices which can be obtained from consumers; and the "bulls," after the experience of the past two months, are hardly in the humour to risk further purchases. So there is, as it has been now for some time, simply a hand-to-mouth business; and it is difficult to foretell how soon a change will come. It is an open secret that consumers are letting their stocks run down to a vanishing point. It is their interest to do so; but they clearly dare not keep off the market much longer, without risking the chance of losing business. Quotations remain at £13 7s. 6d. to £13 10s.

LONDON, *Sept.* 8.

Tar Products.—Benzols continue in request, at slightly better rates. As there is a greater improvement in 90's than in the value of 50's, it looks very much as if the former are going into consumption for other purposes than the production of aniline. Solvent naphtha is firm; but the make is small, and manufacturers hold practically no stock. Creosote oils are dull, and lower prices are being expected; while for heavier oils for lubricating purposes there is a firm market. A slight improvement has taken place in the price of carbolic acid and its products. Anthracene is still quoted at Committee's prices; but parcels outside the Committee are being sold at somewhat lower rates. The production of tar products in Germany and Belgium, as well as in France, from coke-ovens is becoming a serious factor in this market. There are sellers of German benzol here now, at slightly less prices than quoted below. Tar contracts are now being closed at prices ranging from 14s. to 18s. Pitch is still inquired for at 34s. spot, and 33s. forward delivery; while the other products may be valued as follows: Benzols, 90's, 1s. 1½d.; 50's, 1s. 1½d. Solvent naphtha, 1s. 4d. Toluol, 1s. 5d. Creosote, liquid, 2½d.; ordinary, 1½d. Creosote salts, 15s. Cresylic acid, 10½d. Crude benzol naphtha, 30 per cent., 5d. Carbolic acid, 1s. 7½d. Anthracene, "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia.—This is steady at £13 10s. to £13 12s. 6d., less 3½ per cent., according to position and conditions of delivery. Comparatively small business is being done, as the production is at its minimum, and makers do not hold any stocks. Gas liquor is quoted at 10s. to 11s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The coal trade of this district, except perhaps a slightly increased inquiry for the better qualities, continues without improvement; and the position is not likely to be rendered any stronger by the break up of the Coal Sales Association—an event which for some time past has been regarded as almost inevitable. Complaints of underselling by members of the Association have been rife, until at length the largest colliery concerns in Lancashire have withdrawn from the Association, with the result that the other members have not felt themselves in a position to carry it on any longer, and the Association has now virtually collapsed. The Association, during the early stages of its existence, had some influence in strengthening the position of coalowners with regard to the gas-coal contracts; and no doubt it enabled rather better prices to be got. As the season advanced, however, it ceased to have any really controlling influence; and coalowners throughout Lancashire and Cheshire are now practically free as to any action they may take in their own interests, with regard to prices. In some cases, this may possibly lead to slight modifications where the colliery concerns were previously being undersold, and, being bound by the Association list rates; could not move in their prices; but the near approach of the winter demand will no doubt have a steadying effect, and it is improbable that there will be any very material change in prices. Generally, quotations remain much the same as those last given; any weakening tendency being chiefly in connection with engine classes of fuel. The better classes of round coal average 11s. for best Wigan Arley; 10s. for seconds Arley and Pemberton four-feet; and 8s. for common house-coals. Common round coals, which still move off very slowly, for iron making and general manufacturing purposes, average about 7s. to 7s. 6d. at the pit mouth. Slack, which is more plentiful, and offered very low from other districts, ranges from 3s. 9d. to 4s. for common, 4s. 6d. to 5s. for medium, up to 5s. 9d. to 6s. for the best descriptions at the pit mouth. In the shipping trade, a fair amount of activity is still reported, chiefly in cargoes for Scotland; but no better prices are obtainable. Ordinary steam coal averages more than 8s. 9d. to 9s.; and engine fuel, 5s. 6d. to 5s. 9d., delivered at the Garston Docks, or the High Level, Liverpool.

Northern Coal Trade.—A demand having continued from Scotland for coals of several kinds, the northern coal trade has been fairly brisk, for there is now a fuller demand both for gas and household coals. The very low range of steamship freights, too, has its effect in increasing shipments; so that it would seem that the stocks in the possession of large consumers must be growing satisfactorily before the winter. Best Northumbrian steam coals are steady in demand; and the price varies, according to the extent of the contracts of different collieries, from 10s. 9d. to 11s. per ton f.o.b. Second-class steam coals are from 9s. 6d. to 10s. 3d. per ton; and small steams, having been freely sold for power-raising purposes to Scotland, are steady at from 4s. 9d. to 5s. per ton. In regard to gas coals, the chief alteration in the position is found in the fact that the great companies are now taking larger supplies on contract; and thus there is fuller work at the pits that are favoured with these contracts. A little doubt as to the policy of the Durham miners is inducing some to keep fuller stocks of gas coal. Prices vary from about 7s. 3d. for best Durham gas coals, up to 7s. 9d. generally, though one or two of the pits that have most of their production disposed of by contract, ask as high as 8s. per ton f.o.b. Manufacturing coals meet a steady demand—larger than usual at this time of the year; and there is very little stock at the pit's mouth, as is sometimes the case in autumn. Smithy coal is firm in demand, with steady prices. In coke, the position varies in the different parts of the district; the exports being smaller than a year ago, and the quantities sent to the north-west being also restricted. The price of best coke varies from about 13s. to 14s. per ton f.o.b. Gas coke is in a little better request; but the output is now increasing. The stocks, however, of gas coke are very limited; and thus the production is, generally speaking, disposed of as it is made—there being now a large use at many of the gas-works.

Scotch Coal Trade.—This week prices have gone up a little, on account of the threatened fresh lease of life which the miners' strike has taken. Before, however, the miners' leaders resolved on the uncompromising attitude they have taken up, there was more Scotch coal in the market; and there is still abundance of English coal on sale, the prices for which have not risen appreciably. As a reflex of the situation—more men being at work—the shipments rose slightly. For the week they amounted to 8455 tons—an increase upon the preceding week of 2229 tons, but a decrease as compared with the corresponding week of last year of 167,470 tons. For the year to date, the total shipments have amounted to 3,749,300 tons, which is a decrease upon the quantity in the corresponding period of last year of 997,813 tons, and on the corresponding period of 1892 of 1,289,087 tons.

Sale of Shares.—Last Thursday, at the Queen's Hotel, Sunderland, Messrs. A. T. and E. A. Crow sold by auction 1000 shares of £5 each (entitled to a maximum dividend of 8½ per cent.) in the Sunderland Gas Company; being part of the additional capital authorized by the Company's Act of 1857. The shares were put up in lots of 50; and they were sold at about £9 10s. per share—the total amount realized being £9516.

A Suggestion for Calendar Makers.—A correspondent suggests that, as the time is approaching when tradesmen begin to think of preparing their Christmas presents, it would be an advantage if those who usually present calendars were to have printed upon them the changes of the moon and the times of the sun's rising, as such information, being very useful, would, he thinks, save them from the waste-paper basket, and ensure their preservation for hanging up in various parts of gas-works.

The Charge for the Electric Light in Belfast.—At the meeting of the Belfast Town Council on the 1st inst., the subject of the rates of discount to be adopted in connection with the supply of the electric light was under discussion. Alderman Pirrie explained that it was necessary that the discounts in the cases of gas and electricity should be as nearly as possible the same; and therefore the Electric Light Committee proposed the following scale. On quarterly accounts of £2 10s. and up to £5, 2½ per cent.; £5 and up to £7 10s., 5 per cent.; £7 10s. and up to £10, 7½ per cent.; £10 and up to £20, 10 per cent.; £20 and up to £40, 12½ per cent.; £40 and up to £70, 15 per cent.; and £70 and upwards, 17½ per cent. This scale was agreed to.

The "Bath-Tax" Agitation in South London.—A conference of representatives of the Vestries and District Boards in South London took place last Friday, on the subject of the charges made by the Metropolitan Water Companies; and it was unanimously resolved: "That the conference resolves itself into a Committee, with power to add to the number, for securing the abolition of the Lambeth bath-tax, the said Committee to be called 'The Lambeth Bath-Tax Abolition Committee,' having for its objects (1) to obtain a final declaration of the law as to the right of the Lambeth Water Company to charge for a bath in a private dwelling-house, and to obtain such an alteration of the law as will prevent water companies from cutting off the supply of water to a private dwelling-house for the non-payment of water-rates, and confine them to the ordinary processes of law which are found sufficient for the recovery of rent, rates, and taxes." It was also resolved that a fund, to be called "The Lambeth Bath-Tax Abolition Fund," should be opened, and that water consumers should be advised to pay the bath-tax under protest, pending a decision of the House of Lords. A letter was read from Mr. Archibald E. Dobbs, in which he surveyed the whole legal situation.

Gas v. Oil at Winchcombe.—As the result of being beaten in a lawsuit brought against them by the local Gas Company, the Lighting Inspectors of Winchcombe set up oil-lamps in the streets last winter. A public meeting was held on Friday night to consider the lighting for the coming season. The Company sent in a tender offering to light the 43 lamps for £64 10s., to include lighting, cleaning, &c. Mr. Troughton, one of the Inspectors, endeavoured to show that the gas consumed at 5 cubic feet per hour would only come to 17s. 6d. per lamp; but Mr. A. H. Smith said the total hours of consumption had been much underrated, and at 5s. per 1000 cubic feet the sum asked was fair and reasonable, to include all the work connected with the lamps. Mr. A. Richards, Manager of the gas-works, showed the irregularity of the oil lighting last season; and this was admitted by Mr. Troughton, who promised to put on a second lamplighter. Mr. E. S. Wood said the amount asked for by the Company was too large. Let the gas be paid for by meter, at 5s. per 1000 cubic feet. He urged them to leave the streets in darkness altogether, rather than again endure the miserable oil-lamps of last winter. The Chairman, in closing a long discussion, said strangers who entered the town last winter jeered and laughed at the oil-lamps; and there was no doubt the light was unsatisfactory. If the Inspectors had promised to try better oil-lamps in some of the prominent positions, they would have shown a stronger case for a continuance of their experiment. By a majority of 26 to 21, the meeting decided to light by gas; and after a conversation as to price, Mr. Richards promised to supply at a cost of 28s. per lamp. It was shown that similar towns in the neighbourhood are paying, on an average, much more for their street lighting than the amount asked by the Winchcombe Company.

The Gas and Oil Engine and Dynamo Supply Company, Limited, has been registered, with a capital of £5000, in £1 shares, to carry on business as mechanical and general engineers and tool makers.

The Proposed Purchase of the Fylde Water-Works by the Local Authorities.—The scheme for the purchase of the undertaking of the Fylde Water Company by the neighbouring Local Authorities has been advanced a stage; a resolution having been passed by the representatives of the governing bodies in the Fylde and Garstang Unions to the effect that such purchase be made. The proposal is that the works should be managed by a Joint Water Board, comprising representatives from all the sanitary authorities in the area of supply; but the immediate question before the ratepayers is the amount to be paid for the undertaking.

The Clerkship to the Accrington District Gas and Water Board.—The undertaking of the Accrington Gas and Water Company having been bought by the Local Authorities, the first duty of the Joint Board will be to appoint a Chairman and Secretary. "The filling of the first-named position," writes our local correspondent, "does not present any difficulty as it will fall to the Mayor of Accrington (Alderman Haywood), who has had a long and intimate connection with the directorate of the Gas Company. In regard to the secretaryship, however, matters are different. On the one hand, it is urged that the post should be given to Mr. Aitken, the Town Clerk of Accrington; but it is contended, on the other, that the claims of Mr. Charles Harrison, the Secretary to the late Company, should not be ignored. The question, in fact, is exciting a good deal of interest in the district; and the claims of the two gentlemen named for the position are much canvassed among those likely to have any influence with the representatives to the Joint Board. The Clerks to the Local Boards included in the area of supply are said to be 'in the running' now."

Interruption in the Electric Lighting of Londonderry.—At the meeting of the Londonderry Corporation last Thursday—Alderman Sir W. Miller, J.P., presiding—a report was submitted from the resident Electrical Engineer (Mr. Christie) to the effect that between Aug. 22 and Sept. 4 seven failures of the electric light had taken place, throwing about one-fourth of the portion of the city lighted by electricity in darkness for a night on each occasion. Six of the failures were due to ruptures in the cable at different parts of the circuits. In the seventh case, the failure, which extinguished 22 lamps, was caused by a faulty contact in one of the lamps. The failures, Mr. Christie added, were not at all attributable to any action of his or of the staff. Mr. Hastings (Chairman of the Lighting Committee) said he had asked for a full statement of the facts from Mr. Christie, as the Council had been kept in the dark too long. A letter was read from Messrs. Siemens Bros. declining to admit that the repeated failures in the cable were due to defective manufacture or to careless handling on the part of their men. As, however, they were greatly interested in the success of the installation, they would consider the question of defraying the expense to which the Corporation had been put in reopening and closing the streets to reach the defective parts of the cables. A question was asked regarding any suggestions for preventing these failures in the future; but Mr. Hastings said such questions could not be answered. Messrs. Siemens were responsible for the working until May 29, 1895, when their period of maintenance would terminate. It transpired that Mr. Blake, under whom the installation was introduced, had gone to London to consult Dr. John Hopkinson, who had already passed the specifications; but Dr. Hopkinson's opinion had not arrived. A letter had come from him, which the Chairman declined to make public. The report of the Lighting Committee showed that, after directing the City Surveyor to arrange for the erection of 105 temporary lamps to supply the remaining portion of the city not lighted by electricity, they decided to offer £450 to the Gas Company for all the 670 gas-lamps in the city; and the offer was accepted. The reports were adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 509.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	10	13—14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	10—11	+½	14 10 10
200,000	5	11 May	6½	Bombay, Limited	5	6—6½	..	5 0 0
40,000	5	,,	6½	Do. New	4	4½—5	..	5 4 0
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	222—227	..	5 1 4
180,000	,,	,,	8½	Do. New	100	172—177	..	4 16 1
220,000	Stck.	15 Mar.	11†	Brighton & Hove Original	100	210—215	..	5 2 4
888,500	Stck.	30 Aug.	5	Bristol.	100	112—115*	..	4 6 11
320,000	20	29 Mar.	11½	British.	20	48—49	+½	4 11 5
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21—22*	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16—17*	..	5 0 0
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	6½—6¾	+¼	2 19 3
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	99—101	..	5 18 10
150,000	20	12 July	8	Cagliari, Limited	20	25½—26½	..	6 0 8
550,000	Stck.	12 Apl.	13†	Commercial, Old Stock	100	265—270	..	4 16 4
165,000	,,	,,	10†	Do. New do.	100	195—200	..	5 0 0
160,762	,,	14 June	4½	Do. 4½ p c. Deb. do.	100	132—137	..	3 5 8
800,000	Stck.	14 June	13	Continental Union Limited.	100	239—244	..	5 6 7
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	210—215	..	4 13 0
535,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk.	100	105—110*	..	4 10 11
486,090	10	27 July	11	European, Limited	10	22½—23½	..	4 13 7
354,060	10	,,	11	Do. Partly paid	7½	16—17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	240—245	−3	4 17 11
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	271—276	..	3 12 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200—205	+5	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	179—184	..	3 16 1
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	270—275	..	3 12 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	11 May	12	Imperial Continental	100	227—232	..	5 3 5
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	4¾—5¼	..	5 14 3
560,000	100	2 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	109—111	..	4 10 1
541,920	20	14 June	5	Monte Video, Limited.	20	14½—15½	..	6 9 0
150,000	5	30 May	8	Oriental, Limited	5	6¾—7¼	..	5 10 4
60,000	5	29 Mar.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	31 Jan.	2	Pará Limited.	10	1¼—1½	..	11 8 6
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102—107	..	5 12 1
500,000	100	1 June	6	and Do.	100	95—100	..	6 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	9—10	..	6 0 0
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	320-325*	..	4 15 3
1,350,000	,,	,,	12	Do. B do.	100	273-278*	+1	4 6 4
260,000	,,	,,	13	Do. C do.	100	284-289*	..	4 9 11
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	156—161	..	3 2 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	215-220*	..	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	285—290	..	3 9 0
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	229—234	..	3 8 5
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147—152	..	2 19 2
700,000	50	14 June	8½	Grand Junction	50	120—124	+1	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	300—305	..	3 18 8
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	260—265	..	3 11 8
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207—210	..	3 11 5
330,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132—135	..	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	382—387	+2	3 2 8
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	134—137	..	2 18 4
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168—173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	149—152	..	3 19 0
1,155,066	Stck.	14 June	10	West Middlesex.	100	273—278	..	3 12 0

*Ex div.

† Next dividend will be at this rate.

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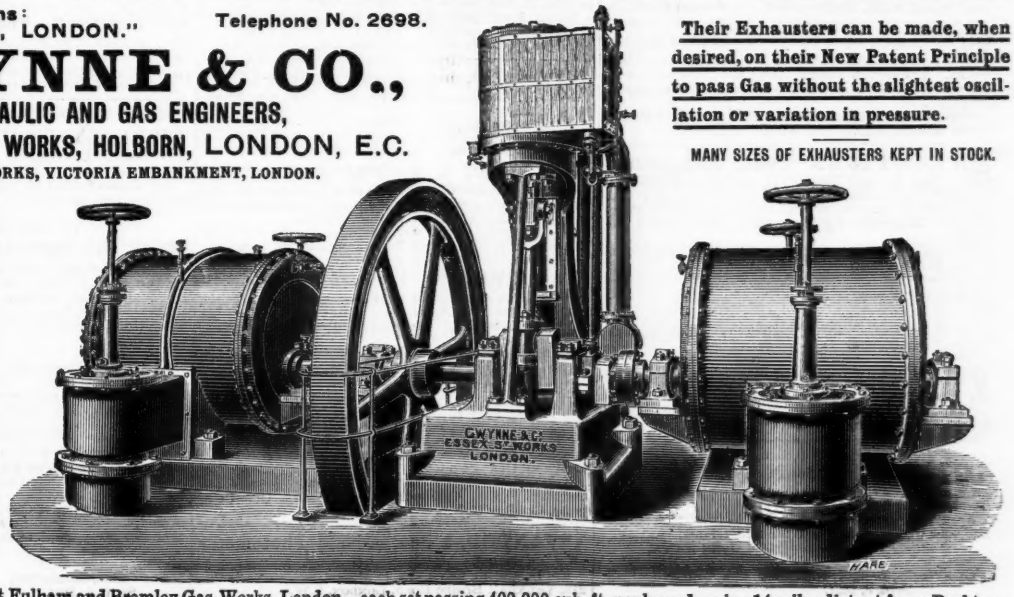

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*** See Advertisement p. 502, of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT
FOR ALL LEAKAGES.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

EXHIBITION OF GAS APPLIANCES.

AN Exhibition of Gas Appliances will be held in the Borough Hall, Stafford, commencing on Oct. 17, and continuing until the 20th.
MANUFACTURERS and others DESIROUS OF EXHIBITING can obtain FULL INFORMATION on application to Mr. J. F. BELL, Gas Offices, STAFFORD.

WANTED, a good, steady Gas-Fitter for Compo. and Iron Pipes, Cookers, Gas-Fires, Meters, &c.
State wages, &c., to No. 2425, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager, to undertake all the duties of a Small Gas-Works, making about 3 millions per annum. Salary 30s. per week, with House, Coal, Gas, and Garden.
Applications, with testimonials, to be sent to R. DEMPSTER, Eden Hall, Penmaenmawr, N. WALES.

CARBONIZING Foreman Wanted, in a large Gas-Works near London. Good wages will be given to a Man having a thorough knowledge of Manual Stoking Machinery, Regenerative Furnaces, &c.
Address letter, stating age and experience, to No. 2429, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN.

WANTED, an Energetic Man as FOREMAN. Must be thoroughly experienced in Carbonization, Main Laying, and Fitting. House, Coal, and Gas provided.
Apply, with testimonials and state wages required, to CHARLES DAKIN, Engineer and Secretary, Gas Company, Cradley Heath, STAFFS.

WANTED, a Second-hand Photometer (Evans).
Reply, stating price, &c., to Messrs. GOODSON AND Co., 213, Vauxhall Bridge Road, LONDON, S.W.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 493.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

REDHILL GAS-WORKS ASSESSMENT APPEAL.

THE Report of the proceedings at the hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been reprinted (by desire) in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

CYANIDES.

WANTED, Particulars of manufacture from Gas Liquor and Spent Oxide. Communications treated as confidential.
Mr. BROTHERTON, Commercial Buildings, LEEDS.

GAS CARBON—4-ton Loads and up- wards purchased by the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKSHIRE.
State Price f.o.r. at nearest Station to Gas-Works.

TEN-HORSE Power "Trusty" Gas- ENGINE, by Weyman, FOR SALE. Cost £220 two years ago. Will be sold for half-price, to clear at once. Guaranteed in good working order.
Apply to W. BIRCH, HIGH WYCOMBE.

BISHOP'S STORTFORD GAS COMPANY, LTD.

FOR SALE—Two Crossley Gas-Engines. One 3½-horse power, old type; and one 2-horse power, new type.
For Particulars and Price, apply to J. W. PORTASS, Engineer and Manager.

TO TAR DISTILLERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the surplus TAR produced (about 1500 tons) for the next Twelve Months, from Sept. 30.
Endorsed tenders to be sent to the Chairman by Saturday, the 22nd day of September.
(Signed) JOHN CHEW, Engineer.
Gas Office, Blackpool, Sept. 6, 1894.

CARNARVON CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for the surplus TAR produced at their Works for One Year ending Sept. 30, 1895.
The quantity of Coal carbonized will be about 2000 tons.
Further Particulars may be obtained from the undersigned, to whom tenders must be addressed not later than Saturday, Sept. 22 inst.
THOMAS WILKINSON, Manager.
Gas Office, Carnarvon, Sept. 6, 1894.

DARWEN CORPORATION.

TO TAR DISTILLERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for all their surplus production of TAR from 19,000 tons of Coal to March 31, 1895.

Tenders, endorsed "Tar," to be sent to C. Costeker, Esq., Town Clerk, Darwen, on or before the 22nd inst.

THOS. DUXBURY,
Manager.

Gas-Works, Darwen,
Sept. 8, 1894.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply of 600 tons of OXIDE OF IRON for Purifying the Gas at their Works.

Forms of Tender and further Particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Oxide of Iron," to be sent to me not later than Five p.m., on Thursday, Sept. 20, 1894, addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
Sept. 4, 1894.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 730 tons of SPENT OXIDE.

Further Particulars and Forms of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Spent Oxide," to be sent to me not later than Five p.m., on Thursday, Sept. 20, 1894, addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
Sept. 4, 1894.

BOROUGH OF BRIGHOUSE.

TO IRONFOUNDERS.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of
2200 yards of 6 in. diam. CAST-IRON GAS-MAINS.
1600 " 4 in. " " "
600 " 3 in. " " "
60 CAST-IRON LAMP PILLARS.

Specification and Form of Tender can be had on application to the undersigned at the Public Offices, Brighouse.

Sealed tenders, endorsed on the outside "Cast-Iron Mains" or "Lamp Pillars" as the case may be, are to be sent in on or before Monday, the 17th day of September, addressed to the Town Clerk, Public Offices, Brighouse.

The lowest or any tender not necessarily accepted.

By order,
JAMES PARKINSON,
Engineer.

Public Offices, Brighouse,
Aug. 30, 1894.

BOROUGH OF BRIGHOUSE.

TO MAIN LAYERS.

THE Gas Committee are prepared to receive TENDERS for the LABOUR ONLY for DIGGING AND LAYING
2200 yards of 6-in. CAST-IRON GAS-MAINS.
1600 " 4-in. " "
600 " 3-in. " "

Specification and Form of Tender can be obtained on application to the undersigned at the Public Offices.

Sealed tenders, endorsed on the outside "Main Laying," are to be sent in on or before Monday, the 17th day of September, addressed to the Town Clerk, Public Offices, Brighouse.

The lowest or any tender not necessarily accepted.

By order,
JAMES PARKINSON,
Engineer.

Public Offices, Brighouse,
Aug. 30, 1894.

CROMER WATER-WORKS.

TO CONTRACTORS.

THE Cromer Water-Works Company, Limited, invite TENDERS for the Construction and Completion of a RESERVOIR, capable of containing 605,000 gallons, together with the necessary RISING MAIN, SERVICE-PIPE, WASH-OUT, and OVERFLOW PIPES, VALVES, INDICATOR, and other WORKS in connection therewith, upon certain Land within the parish of Cromer, together with the MAINTENANCE THEREOF for a period of Six Calendar Months after completion.

Specification, with Bill of Quantities and Schedule of Prices, together with Form of Tender, may be obtained, and the Plans inspected, at the Office of the Engineer, Mr. J. C. Melliss, M. Inst. C.E., 233, Gresham House, Old Broad Street, London, E.C., or at this Office, on payment of Five Pounds, in Bank of England Note, which will be returned on receipt of a *bonâ-fide* tender.

Sealed tenders, properly filled in and addressed, and marked outside "Tender for New Reservoir," are to be sent to the undersigned, at or before Noon, on Saturday, the 22nd day of September, 1894.

The Company do not bind themselves to accept the lowest or any tender.

P. E. HANSELL,
Secretary.

Cromer, Norfolk,
Sept. 3, 1894.

RAMSGATE CORPORATION.

(GAS DEPARTMENT.)

THE Committee invite Tenders for the supply of—
300 CAST-IRON SOCKET and SPIGOT PIPES, 12 ft. 4½ in. long and 12 in. diameter.
200 CAST-IRON SOCKET and SPIGOT PIPES, 9 in. diameter.
Together with sundry SPECIAL CASTINGS.

Tenders to be sent in not later than Sept. 29, 1894, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Pipes."

The Committee do not bind themselves to accept the lowest or any tender.

Full Particulars on application to

WILLIAM A. VALON,
Engineer.

SOUTH SHIELDS GAS COMPANY.

TO COALOWNERS.

THE Directors of the South Shields Gas Company invite TENDERS for the supply of 32,000 tons of clean unscreened GAS COAL, for delivery, as required, from September, 1894, to June, 1895, inclusive, into Craft and at the Company's Depôt, South Shields.

The Directors reserve to themselves the right of taking the Coal in one or more lots.

The lowest or any tender not necessarily accepted.

Further Particulars may be obtained at the Gas-Works, on application to Mr. W. J. Warner, the Engineer.

Sealed tenders to be delivered to the undersigned not later than Friday morning, the 14th inst., endorsed "Tender for Coal."

J. H. PENNEY,
Secretary.

Gas Offices, Chapter Row,
South Shields, Sept. 4, 1894.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Windsor Royal Gaslight Company are prepared to receive TENDERS for the purchase of their surplus COAL TAR and AMMONIACAL LIQUOR (10-oz. Liquor) for One year, from Sept. 30, 1894.

The Tar will have to be removed in barrels; but the Liquor can be pumped into railway tanks on the Great Western Railway.

The Contractor must be prepared to keep the Company cleared of both Tar and Liquor, and to provide all the necessary barrels for the purpose.

The Directors do not bind themselves to accept the highest or any tender.

Any further Information may be obtained on application to Mr. J. Wadeson, Manager.

Sealed tenders, stating price at the Company's Works free of all charges, must be sent in by Twelve o'clock at Noon on Tuesday, the 2nd day of October, 1894.

By order,
JOHN HENRY STRANGE, Secretary.

Gas Offices, Victoria Street, Windsor.

SOUTHEND GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, No. 52, High Street, Southend, Essex, on Wednesday, the 19th day of September next, at Two o'clock precisely, to receive the Report of the Directors and the Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, and for transacting General Business.

The Transfer Books will be closed from the 9th to the 19th of September, both days inclusive.

By order of the Board,
JAMES T. RANDALL,
Secretary.

Offices of the Company:
No. 52, High Street, Southend-on-Sea,
Aug. 30, 1894.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 26th inst., at Half-Past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 15th, and RE-OPENED on the 27th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 5, 1894.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate, E.C., on Thursday, the 4th of October, 1894, at Twelve o'clock Noon precisely, pursuant to Act of Parliament.

And Notice is Hereby Further Given, that, immediately at the close thereof, a SPECIAL GENERAL MEETING of the Proprietors will be held for considering and determining as to the CREATION and ISSUE of the DEBENTURE STOCK authorized to be raised by the East London Water-Works Act of 1894.

The Transfer Books in respect of the Ordinary Stock will be closed on the 20th of September, and re-opened on the 11th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, E.C.,
Sept. 8, 1894.

CRYSTAL PALACE DISTRICT GAS COMPANY.

SALE BY AUCTION OF £15,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

NOTICE is Hereby Given that the Directors have Instructed Mr. ALFRED RICHARDS to SELL BY AUCTION at the Mart, Tokenhouse Yard, E.C., on the 10th day of October next, £15,000 of FIVE PER CENT. PERPETUAL DEBENTURE STOCK OF THE COMPANY, pursuant to the Powers contained in the Crystal Palace District Gas Act, 1893 (56 and 57 Vic.), and the Resolution passed at a Meeting of Proprietors held on the 24th of August last.

Purchasers to make full payment before the 31st day of October, from which date Interest will accrue payable on the 15th day of January, and the 15th day of July in each Year, calculated to the expiration of the preceding Half Year.

Particulars and Conditions of Sale can be obtained at the OFFICES OF THE COMPANY, Lower Sydenham, LONDON, S.E.; of the Solicitors, Messrs. BLYTH, DUTTON, HARTLEY, AND BLYTH, 112, Gresham House, OLD BROAD STREET, E.C.; and of the AUCTIONEER, 816, High Road, TOTTENHAM, and 18, FINSBURY CIRCUS, E.C.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works, Lower Sydenham, S.E.

SWANSEA, GLAMORGANSHIRE.

IMPORTANT SALE OF SWANSEA GAS SHARES.

MESSRS. JOHN M. LEEDER & SON will offer for SALE by PUBLIC AUCTION (pursuant to the provisions of "The Swansea Gas Order, 1888") at the Mackworth Arms Hotel, Wind Street, Swansea, on Friday, Oct. 5, 1894, at half-past Two o'clock precisely, 400 New Ordinary Seven per Cent. SHARES, 1888, of £35 each, in the SWANSEA GASLIGHT COMPANY; being part of the additional Capital the Company is authorized to raise by the "Swansea Gas Order, 1888."

The Shares will be entitled to Dividend at the rate not exceeding Seven per cent. per annum, and will rank equally in respect thereof as part of the Original Capital of the Company. All the lots will be sold with the right to Dividend accruing as from the 1st day of October, 1894. The Company have for many years paid full maximum Dividends and they have a large Reserve Fund which is available for maintaining such Dividends.

For full Particulars and Conditions of Sale, apply to Mr. THORNTON ANDREWS, Secretary, Gas-Works, SWANSEA, or to the AUCTIONEERS, at their Offices, Goat Street, SWANSEA.

REMOVING

CARBON FROM GAS-RETORTS.

GOOD & SPENCER'S

PATENT.

For Royalties, apply **J. E. & S. SPENCER, 14, Gt. St. Thomas Apostle, London, E.C.;** and for Scurfing-Tool, price 3/- each, to **JOHN SPENCER, Glo be Tube Works, Wednesbury.**

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,

PARK STREET, SOUTHWARK, E.C.,

And at STROUD, GLOUCESTERSHIRE.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

LOW MOOR BLACK BED

GAS COAL.

YIELD OF GAS PER TON · 10,375 CUBIC FEET.
ILLUMINATING POWER · 17·50 SPERM CANDLES.
COKE · · · · · · · 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,

RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

MICHAEL AND WILL ON GAS AND WATER
On the 17th of September will be ready, in One Volume, Royal 8vo., 32s. cloth,

The Law of Gas, Water, & Electric Lighting.

New Edition.
Re-written and brought down to date by
J. SHIRESS WILL, Q.C.
London: BUTTERWORTHS, 7, FLEET STREET. (Her Majesty's Law Publishers.)

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, Ipswich Gaslight Company, Devonport Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON AND COAL COMPANY, Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]
TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY,
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13¾ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

JAMES & WILLIAM WOOD, Limited,

GAS COAL AND CANNEL CONTRACTORS AND EXPORTERS,

57, GRACECHURCH ST., LONDON, E.C.

Registered Office—28, ROYAL EXCHANGE SQUARE, GLASGOW.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

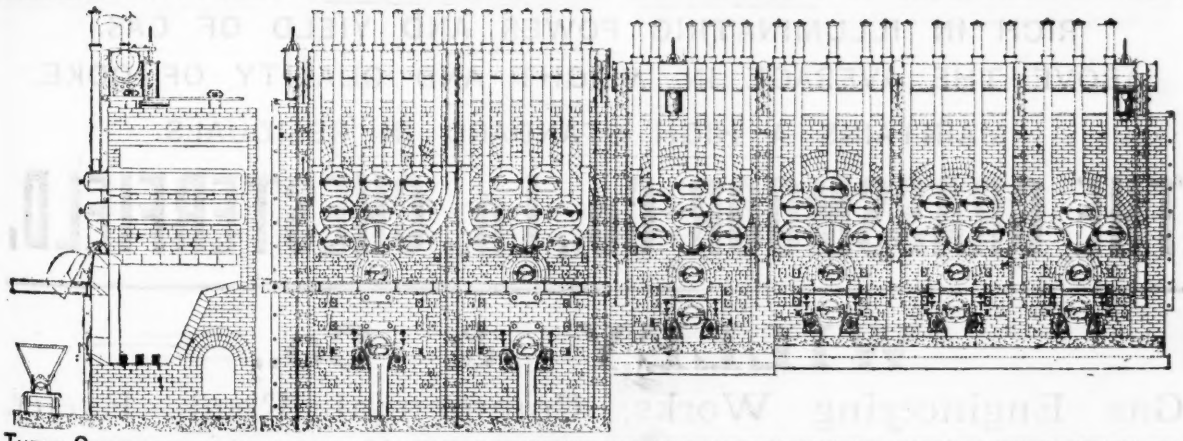
CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
66, ROBERTSON STREET, GLASGOW.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS, CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS, AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

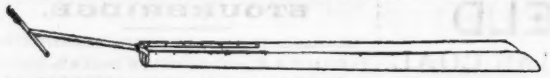
Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings; or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS
Under G. R. HISLOP'S Patents, all Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.
Descriptive Pamphlets and Terms from Agents as above.

STEEL SCOOPS
FOR
RETORT CHARGING.



Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

FOR **TUBES AND FITTINGS** APPLY TO
JOHN BROTHERTON, LTD., IMPERIAL TUBE WORKS, **WOLVERHAMPTON.**

CURLEY CANNEL.

Mr. JOHN METHVEN, Gas Engineer of The Gaslight and Coke Company, Beckton, has tested this famous Cannel, and says:
"The above results indisputably place this Cannel at the *head of the list* of the most valuable Cannel raised in this Kingdom."
Particulars, Analysis, and Prices to be had on application to
S. CHANDLER & SONS, PONTYBODKIN, NORTH WALES.

R. DEMPSTER & SONS, LTD.
Every Description of Gas Apparatus.
ELLAND, YORKS.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., LD., CHESTERFIELD.

WILLEY & Co.,
Gas Engineering Works, Commercial Road, Exeter,
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS.

GASHOLDERS, Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extension** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS, and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

THE DAVIS GAS-STOVE COMPANY, LIMITED,

ARTISTIC HEATING STOVES.

No. 1904.

Best Berlin Blacked, Coloured Tiles in Panels back and front, four Majolica Pillars, Majolica Moulding round the base.

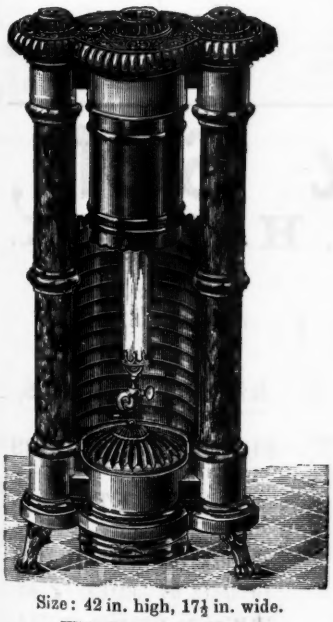
Size: 3 ft. 6 in. high, 2 ft. 4½ in. wide, 1 ft. 10½ in. deep. Price	£12 0 0
Blue Black Enamelled	14 10 0
Electro Brassed or Bronzed	20 0 0

No. 1902.

Best Berlin Blacked, with two Majolica Pillars, Stained Glass and Open Fretwork Body.

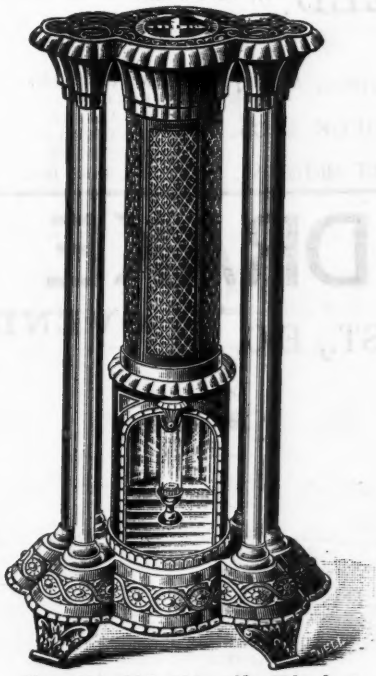
Size: 3 ft. 6 in. high, 2 ft. 4½ in. wide, 10 in. deep .. Price	£7 10 0
Blue Black Enamelled	9 0 0
Electro Brassed or Bronzed	12 12 0

No. 1892.



Size: 42 in. high, 17½ in. wide.
With Terra Cotta Pillars.
Price £3 3 0
If with Polished Copper Pillars, same Price.
Fluted ditto, 15s. extra.

No. 6 PS.



Size: 42 in. high, 21 in. wide, 16 in. deep.
Berlin Blacked, Brass Pillars,
Price £4 10 0
Best Blue Black Enamelled,
Price £5 15 0
Electro Bronzed or Brassed, and Copper Pillars,
Price £8 15 0

No. 1891.

Japanned Cast-Iron Pillar.
Size: 3 ft. high, 7 in. diameter.
Required space, 13 in. by 13 in.
Price £2 2 0
If best finished, and with Polished Copper Pillar,
Price £3 10 0

FACTORY & OFFICES: CAMBERWELL. Show-Rooms: 59, QUEEN VICTORIA STREET.

All communications to Camberwell.

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

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CXC	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

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ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

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CHANCE BROTHERS, OLDBURY (Four Apparatus).
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ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

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ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
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JONAS DRAKE & SON,

LONDON OFFICE:
60, QUEEN VICTORIA ST., E.C.

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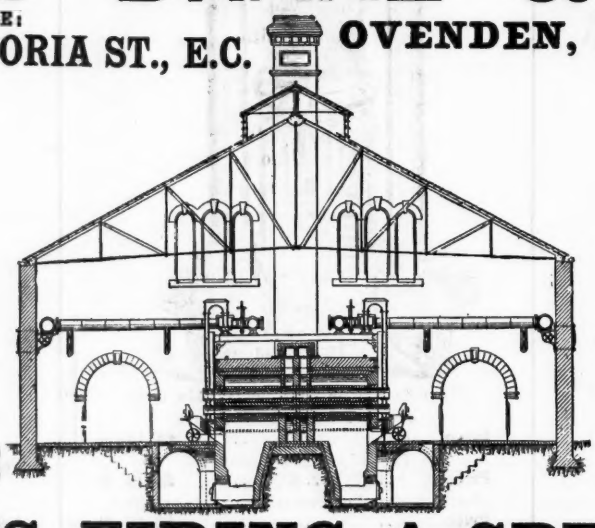
CONTRACTORS,
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.

RETORT SETTERS,
FURNACE BUILDERS
ETC., ETC.



INCLINED RETORTS

EGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.
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PURIFIERS with Planed Joints.

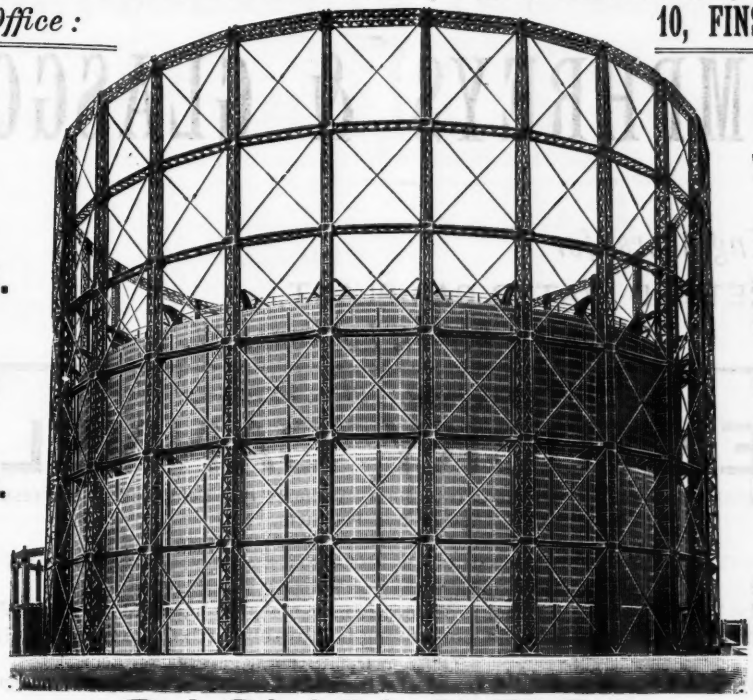
TOWER SCRUBBERS.

PURIFYING-MACHINES FOR AMMONIA.

CONDENSERS.

TAR PLANT.

SULPHATE OF AMMONIA PLANT.



GASHOLDERS.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES, &c., &c., &c.

The above is a view of the largest Gasholder (four-lift) of The Gaslight and Coke Company, Beckton, containing 8 million cubic feet, erected by us in 1892.

Sole Makers of **WECK'S** Patent CENTRE-VALVE, & **CRIPPS'** Patent HYDRAULIC MAIN VALVE.

THE AUTOMATIC GAS-METER CO., LTD.,

UPPER BROOK ST., MANCHESTER.

SOLE PROPRIETORS OF

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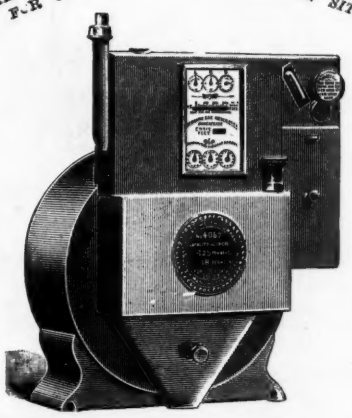
PENNY-IN-THE-SLOT GAS-METERS.

THE AMOUNT OF GAS GIVEN IN EXCHANGE F.R COIN CAN BE ALTERED IN SITU.



The persistent efforts of the Inventors of our Meters have been crowned with

SUCCESS.

There can be no two opinions on the question of the priority of our claim to the consideration of Gas Companies as *the First* Introducers, on a Practical Scale, of a Penny-in-the-Slot Meter.

THE AMOUNT OF CASH PLACED IN THE BOX IS RECORDED. THIS IS A COMPLETE CHECK AGAINST FRAUD.

PENNY-IN-THE-SLOT GAS-METERS.

So long ago as 1889, we advertised our Penny-in-the-Slot Meters as having the now fully-recognized advantage of ability to alter IN SITU the amount of Gas given per Coin. Automatic Meters without Coin-Counting Index are liable to be tampered with.

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HUMPHREYS & GLASGOW,

Contracting Engineers for

CARBURETTED WATER GAS PLANT,

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"BEAR CREEK"

The best **KENTUCKY CANNEL** in the Market.

SAMPLE CARGO will demonstrate the extraordinary value of this Coal, and of the resultant Coke and other Bye-Products.

The unlimited quantity and REDUCED PRICE of this Material makes it the most satisfactory and economical Gas Enricher now available.

COKE.—Briefly the "Bear Creek" Cannel produces a first-class Coke—that is, by itself, and unmixed with Coke from Common Coals—merchantable, comparing favourably with Coke from the Standard Gas Coals.

Correspondence solicited. Printed Reports, Analyses, and Samples for Testing sent on application.

For Cargo Prices either c.i.f. or f.o.b. Norfolk or Newport News, Va., or Pensacola, Florida, address

The Log Mountain Coal, Coke, and Timber Company,
PINEVILLE, KENTUCKY, U.S.A.

Cable Address: "HULL, PINEVILLE" (A.B.C. Code).

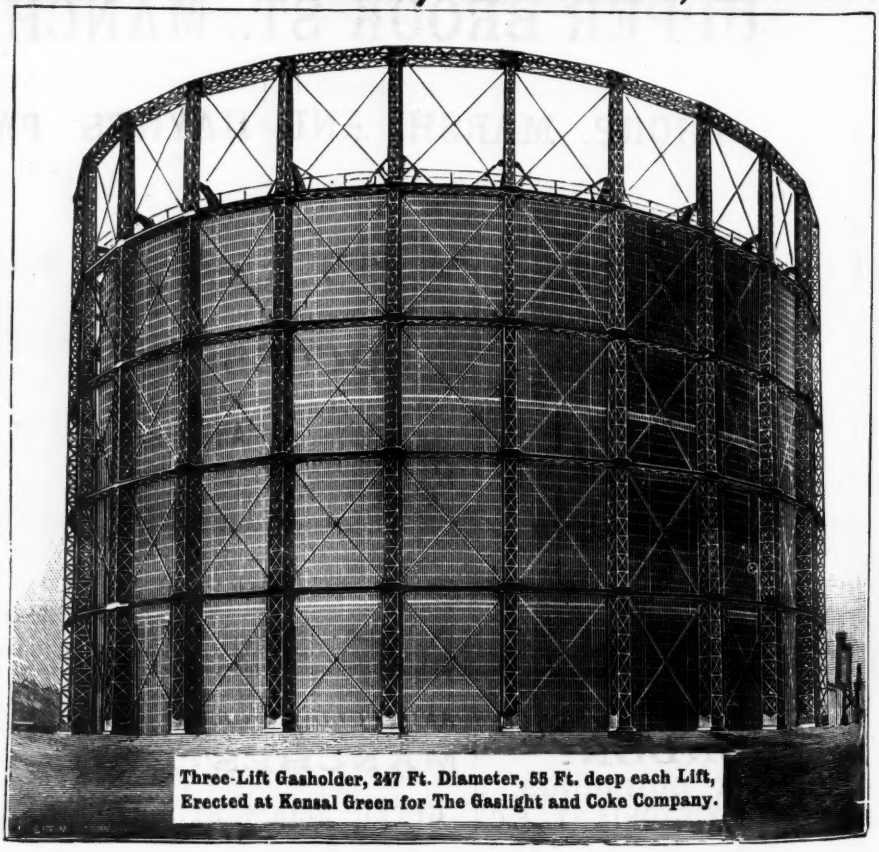
SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY

8 MILLION

CUBIC FEET

CAPACITY.



Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Sept. 4, p. 491.]

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to

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The Climax of Regenerative Gas Lighting!!

THE

"VERTMARCHE"

A 280-CANDLE POWER

PLAIN IRON LAMP,

CLASS A— 55/-

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

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PARTICULARS AND PRICES FREE. AGENTS WANTED.

VOLCANIC FIRE CEMENT

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In Use in more than 200 British Gas-Works.

Heat Resistance, 4500° Fahr.

Directions for Use, and all Particulars, sent post free.

PACKED IN CWT. BAGS.

DEPÔTS AT LONDON, STOKE-ON-TRENT, BIRMINGHAM, MANCHESTER, and GRIMSBY.

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WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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THE THAMES BANK IRON CO.

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SUPPLY FROM STOCK

CAST-IRON RETORTS.

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

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ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

CROWTHER BROTHERS,

Contractors for the Erection of Gas-Works Complete, RETORT-SETTINGS, Furnace Building, the Erection of Retort-Benches, &c., &c.

N.B.—Special attention given to the Erection of Inclined Retort-Benches on the Generator and Regenerative Principles complete.

MAIN LAYING IN ALL ITS BRANCHES.

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POPLAR, LONDON, E.

Telegraphic Address: "GASRETORT, LONDON."

Experienced Retort Setters and Main Layers sent to all Parts on the Shortest Notice.

J. & W. HORTON

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SMETHWICK,

NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES AND MANUFACTURERS OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

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FOR LARGE OR SMALL

RETORT-SETTINGS

PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED.

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ENGINEERS & CONTRACTORS

FOR THE ERECTION OF GAS AND WATER WORKS COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

CLAPHAM BROTHERS, LTD.,

— ESTABLISHED 1837 —

Sole Makers of Laycock and Clapham's

PATENT "ECLIPSE" WASHER-SCRUBBER.

Constructed on a **PRINCIPLE** which has **PROVED MOST EFFICIENT**, and **NOT REQUIRED IMPROVING**, giving the **LARGEST AMOUNT OF FRESHLY WETTED SURFACE** of any machine yet introduced.

68 Machines, with a total Capacity of 76,100,000 Cubic Feet per day, have been supplied, or are in course of erection.

Last year the Manchester Corporation put in an "ECLIPSE" WASHER-SCRUBBER to pass 3,000,000 Cubic Feet per day; and this year have ordered **TWO MORE, each to pass 4,000,000 Cubic Feet per day.**

OTHER LARGE REPEAT ORDERS HAVE ALSO BEEN RECEIVED.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS; MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

CATALOGUES AND FULL PARTICULARS ON APPLICATION.

Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Sept. 11, 1894.